Agricultural Research,
annual report of the Imperial
Council, 1933-34 to 1938-39

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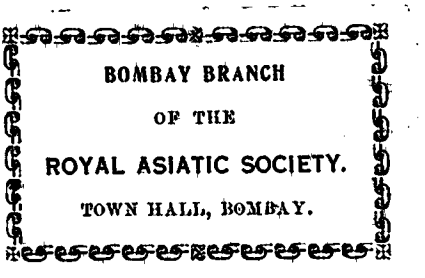

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ANNUAL REPORT

OF THE

IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH

FOR THE YEAR 1933-34 to 1938-39

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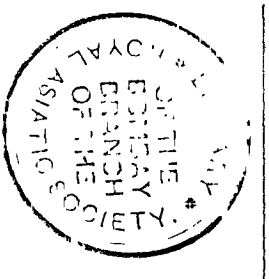

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ANNUAL REPORT OF THE IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH FOR THE YEAR 1933-34.

This is the fourth report on the working of the Imperial Council of Agricultural Research and covers the period 1st April 1933 to 31st March 1934.

2. *Constitution of the Council.*—During the period under review Cochin State secured representation on the Imperial Council of Agricultural Research with the same privileges as those enjoyed by provinces in British India, and by the States of Hyderabad, Mysore and Baroda, which have already been admitted as constituent members of the Council; the State is represented by one member (Dewan of Cochin) on the Governing Body and two members (Superintendent of Agriculture and Senior Veterinary Inspector) on the Advisory Board of the Council. Bhopal and Travancore States secured similar representation shortly after the end of the year.

3. *Changes in the personnel of Administrative Officers.*—The Vice-Chairman, Diwan Bahadur Sir T. Vijayaraghavacharya, was granted leave out of India from the 12th June 1933 to 24th August 1933 during which period he gave evidence before the Joint Parliamentary Committee on Indian Constitutional Reforms on behalf of the Indian Officers' Association. Mr. B. C. Burt, Agricultural Expert to the Council was placed in charge of the duties of the Vice-Chairman in addition to his own duties. Rai Sahib Malik Charan Das, Secretary, Imperial Council of Agricultural Research, was granted leave on average pay for 4 months and three days with effect from the 5th June 1933 and Rai Sahib Tej Bhan Bahl, Superintendent, Imperial Council of Agricultural Research Department officiated in his place.

4. (*a*) *Meetings of the Council.*—The Governing Body and the Advisory Board of the Council met once and twice respectively during the year under review. The Annual General Meeting of the Council was held on the 24th February 1934 at which the Annual Report of the Council and the Annual Report on the accounts of the Council for the year 1932-33 were presented and adopted.

(*b*) *Bye-laws of the Council.*—Two amendments were made in the Bye-laws, *viz.*—

(i) to Bye-law 22, to provide that the Council may, with the previous concurrence of the Accountant General, Central Revenues, appoint as its Accountant a person from the staff of the Accountant General, Central Revenues, having a lesser professional qualification than that of the Subordinate Accounts Service of the Indian Audit Department.

(ii) to Bye-law 32, consequent upon the admission of Indian States as constituent members of the Council it was necessary to amplify this Bye-law so as to provide suitable audit procedure, similar to that adopted for Governors' provinces in British India, for the audit of expenditure from the Council's grants.

5. *Finance.*—As usual the Government of India were approached for a supplementary grant in lieu of the annual research grant of Rs. 5 lakhs which has been suspended. Towards the close of the year under review the Council received a supplementary grant of Rs. 5 lakhs but with the proviso that Rs. 1 lakh of this would be applied to meet the cost of the Marketing Scheme to be started under the aegis of the Council during the year 1934-35. The sum available for new research schemes was thus four lakhs. Owing to financial stringency the Council had perforce to curtail its activities, and approved schemes to the extent of about 11 lakhs of rupees are still awaiting the provision of funds.

6. *Ottawa Trade Agreement.*—The Imperial Council of Agricultural Research *Department* continued to watch the working of the 'Ottawa' preferences on Rice, Paddy, Coffee, Tobacco, Linseed, Groundnuts, Castor-seed, Vegetable oils, Jute, Hemp, Spices and raw Hides and Skins. In consultation with the appropriate committees of the Advisory Board it furnished information to Provinces on a number of points connected with the quality of Indian produce, competition in the United Kingdom market, etc., and brought to the notice of other Departments of the Government of India various matters of importance connected with these preferences. Much information of value was supplied by the Indian Trade Commissioner, London.

7. *Tobacco.*—The importance of the preference on Indian tobacco in the United Kingdom and the possibilities of developing it to India's advantage, has already been referred to in the last year's report. In following up the subject, the Council collected information as to the areas from which tobacco for export is drawn, the types of Indian tobacco which find favour in the United Kingdom market and complaints regarding the material supplied in the past and has also arranged to obtain periodically from the Indian Trade Commissioner London, the latest position of the trade in that country. The information thus collected was placed before the Advisory Board at its meeting held in August 1933 and the question was raised whether in view of changes in the trade position it was desirable to make any modification in the programme of research work on tobacco already approved by the Council. The Board recommended that steps should be taken to supplement the programme of research work already approved by adequate work on cigarette tobacco and that an *ad hoc* committee of specialists on tobacco should be set up to examine the position further. This Committee was appointed after the close of the year under report.

8. *Board of Agriculture and Animal Husbandry in India.*—It was mentioned in the last year's report that a meeting of the Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry was held in New Delhi in February 1933. The Animal Husbandry Wing made many valuable recommendations. They recommended *inter alia* that three standing committees should be appointed to deal with matters connected with Animal Nutrition, Cattle Breeding and Dairying. They also recommended the appointment of an *ad hoc* committee to examine the existing legislation, its application to milk, butter and other products and the area of production and consumption of milk and meat inspection. The Governing Body at its meeting held in November 1933 approved the appointment of these committees, the personnel of which is given in Appendix I. During the year under review the Animal Nutrition Committee met twice and the other Committees met once each and their proceedings are under examination. No meeting of the Crops and Soils Wing of the Board was held during the year under report as largely due to financial stringency the Local Governments and Administrations who were consulted in the matter preferred to postpone the meeting to the year 1934-35. The meeting was subsequently fixed for February 25th—March 2nd, 1935 *i.e.*, immediately

following the winter meeting of the Advisory Board of the Council.

9. *An outline of the Council's work on Animal Health and Husbandry.*—The period of financial depression referred to in the last year's report continued both at the centre and in the provinces. In spite of this the Council has continued its endeavours to stimulate research in various branches of animal husbandry. The Salient features of the work done are stated in brief below :—

(i) *Animal diseases : Disease Investigation Officers in the Provinces.*—In the last two reports mention was made of the appointment of Veterinary Investigation Officers in all Governors' provinces, except Burma and North-West Frontier Province and in the Hyderabad State. The idea underlying the appointment of these officers is to provide a link between the provincial field staff and the research institutions in India and to promote scientific investigation and the collection of authentic data in provinces and States regarding the incidence and economic importance of diseases of livestock in different areas. Provincial Veterinary Investigation Officers are engaged in studying local conditions in the field and supply information and material for systematic record and research at the Imperial Institute of Veterinary Research, Muktesar or other suitable institutions, such as the veterinary colleges where the material can be satisfactorily dealt with. By such collaboration it is hoped, in the course of time, to investigate a large number of local disease conditions, the cause of which is at present not fully understood and to obtain a fairly complete survey of disease conditions throughout India. This investigation staff would moreover be able to test out in the field and adapt to Indian conditions, new methods of disease control and treatment, and would be available to Directors of Veterinary Services to take up the study of local disease problems, under scientifically controlled conditions. At the same time suitable young officers would gain experience in practical disease investigation in the field which should be very valuable in research. The value of the work done by Disease Investigation Officers has already been recognized by Provinces and States in which they are employed and it may be anticipated that at the end of five years the necessity for the permanent provision of such staff and facilities will be generally recognized.

Annual reports from these officers are received and circulated after examination by expert committees of the Advisory Board and these reports have clearly indicated the extent of the investigation work which is required as to disease conditions, the incidence and economic importance of which has not been understood or which are peculiar to livestock in India. Their work has also drawn attention to the necessity for precise investigation of disease conditions the causes of which were known but the control of which had not been adequately studied under field conditions, *e.g.*, Surra among cattle. The investigational work of these officers in regard to the practical application of new methods of disease control based on current research—*e.g.*, Rinderpest and Nasal Granuloma—has also produced results of great economic importance to the country. The results are important to the well-being of the peasant by reducing mortality and to Local Governments by reducing the cost of protective measures against disease.

Another important scheme which has been sanctioned by the Council and which has been financed is one for the investigation of the most suitable and economic methods of combating different types of parasitic infection in ruminants in the field, concurrently with experiments to determine the extent to which mineral deficiencies tend to lower resistance to such parasitic infection in certain areas. There has been a steady increase in parasitic disease among domestic animals, chiefly ruminants, in lowlying damp areas such as riverain districts and in areas which are under water for a portion of the year, due to water-seepage from canals. This scheme has been sanctioned to attempt to ascertain the effects on the health of stock which graze on such flooded areas and the cause of this increased infestation, and to test under strict control various methods of treatment and control of each type of parasite, with due regard to cost. Funds were placed at the disposal of the Government of Punjab during the year under report, but the scheme could not be put into effect immediately due to abnormal climatic conditions.

Mention was made in the last year's report of another important scheme designed to secure a thorough study of Tuberculosis and Jhone's disease among domesticated animals in India. In view of the urgency and importance of the subject the Governing Body of the Council sanctioned a sum of about

Rs. 2 lakhs for undertaking this investigation and it will be given effect to as soon as funds are made available.

The action undertaken by the Council to promote measures for the prevention and control of animal diseases by means of suitable all-India legislation was carried a stage further during the year. The draft bill and the model rules drafted by the Special Committee were approved by the Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry and by the Advisory Board with slight amendments. These are now under the consideration of the Government of India.

(ii) *Animal Nutrition.*—The Government of Bengal applied in 1930 for a grant of Rs. 48,590 for the appointment of a Physiological Chemist to study animal nutrition problems at Dacca. The Agricultural Department of that Province had already been carrying out crop experiments with indigenous and imported fodders, the tests for which had been yield per acre and palatability gauged by their refusal or otherwise by stock. This investigation is however, intended to estimate the nutritional value of the fodders grown and work was started on 2nd January 1932. The first annual report was considered by a Committee and the Advisory Board and certain suggestions were then made for the future prosecution of the work.

(iii) *Animal Industry*—

(*a*) *Goat Breeding.*—In January 1931 the Advisory Board recommended a scheme for research in goat breeding submitted by the Mission Poultry Farm in Etah. The lines of research proposed are :—

(i) Experimentation with Swiss Toggenberg goats to test their suitability for Indian conditions, and to determine whether they will reproduce themselves pure in India without serious loss of vigour.

(ii) Selective breeding of the best *Jumna Pari* goats by means of recorded milk yields and produce tests.

(iii) Selective breeding of the best Bar-Bari goats by means of recorded milk yields and produce tests.

Work was started in June 1931 and two annual reports have so far been received. The opinion of the Committee which examined these reports was, that these were a valuable record of work carefully carried out and that the grant made by the Council had been usefully employed; and it was pointed

out that the publication of Mr. Slater's report had attracted the attention of goat breeders in America who were impressed by the results obtained from some of the best of Mr. Slater's goats. The work is being continued on similar lines and arrangements have been made to record the butter fat content of the milk and to ascertain the cost of production of milk by these goats under the system of management adopted.

(*b*) *Sheep-breeding.*—At the August 1933 meeting of the Advisory Board a special committee was appointed to consider two schemes of sheep-breeding submitted by the Governments of Bombay and Hyderabad. The Committee recommended that a co-ordinated sheep breeding programme should be experimented with in the areas noted against each.

Bikanirs—At Hissar and Hingoli.

Deccani sheep—At Hosur, Bhamburda (Bombay), at Mahbubnagar in Hyderabad State and at a selected centre in Mysore.

Dumbas—At Bharkhand in Baluchistan.

Guddi sheep—At Kangra.

Schemes of sheep-breeding research have accordingly been submitted for the consideration of the Council and a scheme for sheep breeding research in the Bombay Presidency costing about Rs. 85,000 has been approved by the Governing Body of the Council and is awaiting allotment of funds. The scheme from the Hyderabad State was however, withdrawn for revision on the recommendation of the special committee which dealt with it.

(*c*) *Animal Husbandry Bureau.*—In order to develop animal husbandry on proper lines in India it is considered that the following items of work are necessary :—

(1) To continue the systematic examination, collation and publication of such statistical matter as is now being dealt with by the Assistant Statistician in regard to the comparative efficiency of the different feeding scales adopted in the Military Dairies and other dairy farms and the effect of disease and other factors on dairying efficiency.

(2) To develop the regular collection of such data for all India.

(3) To make a start with the official registration of the best breeds of pure bred stock on an all-India basis; and

(4) to provide a nucleus organisation for the industrial development of livestock and livestock industry in India on modern lines.

As in all progressive livestock countries, exact information on such matters with complete statistical data of internal as well as external trade in animal products are essential for the proper development of animal industry. In the absence of breed societies Government assistance is also necessary in India for such essential livestock improvement work as official registration of pedigree stock and it was agreed that an all-India Bureau of Animal Husbandry should be established. Due to financial stringency it was not possible to embark upon an ambitious scheme but the nucleus of such a bureau with an Assistant Statistician has been sanctioned with effect from April 1934. The work that will be entrusted to this staff immediately is—

(*a*) to complete the collection, statistical analysis and publication of the data available in the Military Dairy Farms organisation and other Government Farms and to institute a system for the regular collection of such material in the future.

(*b*) to perfect a system of collecting, collating and publishing all-India statistics regarding the incidence of and mortality from contagious disease among livestock, such as is required for the proper control of contagious disease.

(*c*) to institute an all-India system of registration of pedigree stock (of the best breeds), based on an official definition of their breed characteristics and of officially controlled milk recording in the case of dairy cattle, and

(*d*) the collection and publication of such other information as may be required for the proper development of Animal Husbandry in India.

10. *Veterinary Education.*—The recommendations of the Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry on this subject referred to in last year's

report were submitted to the Advisory Board which adopted the following propositions:—

(i) A three years' course with the F.Sc. as the qualification for admission is the minimum.

(ii) A four years' course from the F.Sc. should be adopted in each veterinary college when conditions permit. The Board cordially approved of the fact that a four-year course is already given at the Punjab Veterinary College and agreed that no recommendation should be made regarding the curriculum in the Punjab Veterinary College.

The recommendations with the draft curriculum have been forwarded to the Education, Health and Lands Department of the Government of India which referred the recommendation of the Royal Commission on Agriculture to the Council.

In regard to the institution of short elementary vernacular courses in dairying in the constituent Indian States of Hyderabad, Mysore and Baroda, it is sufficient to say that these States are alive to the importance of instituting such courses and that necessary action is being taken by them.

11. *Cattle Census.*—The Royal Commission on Agriculture in India drew attention to the lack of uniformity both in the methods adopted and in the time at which the livestock census in India is taken by the various provinces. The Royal Commission recommended that the quinquennial census should be taken simultaneously throughout India, that an effort should be made at the next census to secure uniformity of classification and that, to this end, the heads under which the returns should be made should be settled at the next cattle conference. As the Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry has taken the place of the Cattle Conference and as the meetings of the Board of Agriculture are held under the auspices of the Council the Government of India, Education, Health and Lands Department, referred the recommendation of the Royal Commission to the Council. The subject was considered by the Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry and their recommendations which have been approved by the Advisory Board of the Council are shown in Appendix II. At the close of the year these were under the consideration of the Government of India.

12. *Research Schemes—Agricultural.*—A consolidated statement showing the research schemes in operation will be found in Appendix III. In the succeeding paragraphs an attempt has been made to give so far as considerations of space permit a brief account of the nature, aims and scope of each research scheme and of the progress made in carrying out the older projects. As it is impossible to give any adequate account of the scientific results obtained in an annual report mention should be made of the fact that such results are published in the Indian Journal of Agricultural Science from time to time.

(i) *Rice Research.*—Reference has already been made in the reports for 1929-30, 1930-31 and 1931-32 to the co-ordinated scheme of rice research in India financed by the Council. As stated in the first annual report much work for the improvement of rice cultivation has been in progress in the various provinces for some years. The principal object of the scheme is to fill *lacunae* as economically and effectively as possible, to promote a greater and speedier interchange of information and material between workers in different parts of India, to secure a general improvement in technique and more attention to certain aspects of rice research which had not received adequate consideration in the past. All sections of the scheme were put into operation during 1931-32 except the Assam section which was started in March 1934. A brief account of the progress made as stated in annual reports made to the Council, is given below :—

(*a*) *Madras.*—Research on the Rice crop has been in progress in the Madras Presidency for many years and the organisation maintained by the provincial agricultural department includes a special paddy research station at Coimbatore under the Paddy Specialist, where fundamental work and a certain amount of breeding work is carried out, and three sub-stations for breeding work and other experiments on rice cultivation in different important rice growing tracts. The Council's grant enabled work to be undertaken in a fourth important tract, the Ganjam District. This station also is under the supervision of the Madras Paddy Specialist and is under the immediate charge of a specially trained gazetted officer. Work at the new Berhampore Rice Research Station started on the 25th March 1932. The first progress report covering the year 1932-33 was largely an account of the preliminary work. Experimental work was started on mass and pure line selections

and field experiments on spacing, the age of seedlings and manuring and on various crops, especially fodders, to determine their suitability for the paddy lands in the fallow season. The report was examined by a special Committee of the Advisory Board which made certain suggestions as to the method of working out and recording results in the case of soil fertility studies and manurial experiments. These suggestions were brought to the notice of the Madras Government and have been acted on.

The scheme includes (1) the production of improved strains of paddy by modern plant-breeding methods; (2) the isolation of 'unit species', their description and maintenance; (3) general genetical studies of the Indian rices and the clearing up of obscure points in the inheritance of characters and cultural and manurial experiments on modern lines.

During 1933-34 the study of local varieties and the isolation of strains was continued, cultural and manurial experiments were continued and several statistically significant results obtained which require confirmation in other seasons. Inheritance studies were in progress on the red colour of the grain and the glume colour; also on a possible linkage between black glume colour (when ripe) and red rice. Some crosses have been made to study the effect of texture.

(*b*) *Bengal.*—In the Bengal Presidency also successful research work on rice has been in progress for many years, mainly at Dacca. The Council's grants enabled more adequate attention to be given to the rices of Western Bengal and in particular the group of fine rices known to the trade as 'Patna' or more correctly 'Patnahi' or 'Patnoi', is being specially studied. This rice has already established its position in the United Kingdom market and a definite export trade exists.

Two new research sub-stations, one at Bankura and the other at Chinsura were started with effect from June 1932. The progress report for 1932-33 was examined by a Sub-Committee of the Advisory Board which suggested modifications in the programme of work and drew attention to the need of adopting a more definite method of reporting the results of field experiments. As a considerable degree of uniformity is desirable in this respect, the Committee recommended that a draft form of report should be prepared by the Statistician to the Council and supplied to all the provinces concerned; this has since been done. The Committee's observations have been communicated

to the local Government and suitable action taken. The report for 1933-34 will be considered by the Advisory Board of the Council at its next meeting.

(*c*) *United Provinces.*—The object of this scheme is to expand and develop the botanical work on the United Provinces rices previously carried out by the Provincial Economic Botanist and with special reference to the production of better quality high yielding rices for the new Sarda canal tract where low-yielding broadcast varieties of poor quality were produced before the introduction of canal irrigation.

The Rice Research Station for this province is situated in Nagina and was opened in April 1932. Work during 1932-33 mainly related to development of work started at Cawnpore including hybridisation, cytological studies on the rice plant and the isolation of pure lines. The study of a hybrid between *Sathi*, a quick maturing coarse rice, which owing to its completely enclosed grain is practically immune to the attack of certain pests, and high quality rices, is a prominent item of the programme. A detailed programme of work was approved by the above mentioned committee of the Advisory Board which also examined the report for 1932-33 and made a number of suggestions. During 1933-34, the cultural and manurial experiments were continued and work on the '*Sathi*' hybrids progressed considerably. A cytological study was undertaken of the local, one foreign and one wild rice and their chromosome morphology worked out.

(*d*) *Burma.*—Work on this scheme started at the Agricultural Station, Hmawbi, in June 1932. For a period of five years, half the cost of this scheme is met by a grant from the Empire Marketing Board; the special object of the scheme is to develop rices better suited for the English and European markets. Considerable progress has now been made in that direction and the new types have been well reported on. The work carried out during 1932-33 was largely a development of work previously in hand at the Hmawbi Agricultural Station for a number of years, mainly under the following heads :— hybrids station, pure lines selections, genetical studies including correlation studies and yield and quality tests. Mr. J. W. Grant was appointed Rice Research Officer from 10th November 1932 and Dr. B. P. Pal, Assistant Rice Research Officer from 1st March 1933. The Committee of the Advisory Board expressed its appreciation of the work done and the manner in

which it was reported and suggested that the methods of stating results recommended by them for Bengal might be adopted in Burma in future.

(*e*) *Bihar and Orissa.*—The Bihar and Orissa rice research station was opened at Sabour in January 1932 and small substations have since been started at Cuttack and Ranchi. During the year 1932-33 a survey of the types of rice grown in the Province and the isolation of pure lines, was started, and the collection and growing for observation of certain rices from other provinces and from abroad and other preliminary plant-breeding work was undertaken. The Sub-Committee of the Advisory Board commented favourably on the report and made suggestions for improvement, which have been communicated to the Bihar and Orissa Government.

(*f*) *Central Provinces.*—Work on this scheme started in September 1932 and the first progress report deals with the eighteen months ending March 1934, the first rice season being that of 1933-34 so far as most of the work is concerned. As the result of the Council's grant the Labhandi experimental farm at Raipur has been equipped as a rice research station and the staff includes a Botanist and a Biochemist (with assistants). A soil survey of the principal rice districts of the province was started during the year including a study of the soil profiles, the determination of chemical and physical composition, reaction, humus content and carbon-nitrogen ratio and a study of micro-biological activity. Fertiliser experiments include the study of composts and other organic manures to supplement the inadequate supply of dung and a study of the changes which take place in the soil when various fertilisers are used. It was found that 15 increased yields were obtained when paddy soils were treated with common salt at 100 to 200 lbs. per acre.

Botanical work included the exact testing of existing strains and the production of improved kinds by selection and hybridisation was started. A representative collection of the rices of the provinces was obtained and a detailed study of them commenced.

(*g*) The starting of the *Assam* scheme was delayed until March 1934 owing to difficulties in finding land and the other contributions promised by the Local Government. The research farm is located at Habiganj and work has now commenced.

(ii) *Research on the physiology of the rice plant.*—A research grant has been made to Professor R. H. Dastur of the Royal Institute of Science, Bombay, and the scheme aims at acquiring greater knowledge of the life processes of the rice plant and how these processes are affected by external factors. Work had already been carried out by Professor Dastur on these lines and the Council's grant enabled this to be extended.

This scheme was started with effect from June 1932. The first progress report for the period ending the 31st March 1933 was considered by the Advisory Board in August 1933 and a number of suggestions made which were passed on to Professor Dastur and are dealt with in the second year's report for the year ending March 1934.

The scientific results obtained are being published from time to time in the Indian Journal of Agricultural Science and it is sufficient to say here that the investigation deals largely with the nitrogen requirements of the rice plant at different stages in its growth and the reason why, contrary to expectation, mixtures of solium nitrate and ammonium sulphate, on certain soils and applied at certain times, give better results than either fertiliser alone.

(iii) *Dacca University scheme for research on the mechanical analysis of lateritic soils and the nutrition of the rice plant.*—This scheme which is being conducted under the supervision of Dr. J. C. Ghosh, Head of the Department of Chemistry of the Dacca University is meant to solve two main problems, namely, (i) devising the most suitable method for the analysis of lateritic soils and (ii) the problem of the assimilation of nitrogen by the rice plant. The scheme of work on the first problem was drawn up by the Dacca University in consultation with the Bengal Agricultural Department as the laboratory of the University afforded ample facilities for the research. The second problem is of importance to the whole of India, as well as to Bengal, in view of the importance of the rice crop to the country as a whole. This investigation in consequence is a necessary part of the Council's general scheme of work on rice improvement.

The scheme was started in June 1930 and progress reports for the years 1930-31 to 1933-34 have been received by the Council and examined by the Advisory Board which considered the work done. The scheme is now in its last year but has

been recommended for extension in view of the good progress made.

The new method of mechanical analyses for laterite soils has been completely worked out and on the recommendation of the Standing Soil Science Committee of the Council this is now being published in the Indian Journal of Agricultural Science. Three members of the Sub-Committee have arranged to have the method tested on a wider range of soils in their laboratories. Considerable progress has also been made with the study of the nitrogen supply of the rice plant and of the nitrogen fixation in rice soils. These results will probably be published shortly after confirmation during the current year. In the extension of the scheme, the physico-chemical properties of the clay fraction of lateritic soils and of the Dacca mixed soils will receive special attention.

(iv) *Botanical Sub-Station, Karnal.*—In paragraph 66 of their Report the Royal Commission on Agriculture in India recommended that the Imperial Council of Agricultural Research should determine how far the deficiencies of the Imperial Institute of Agricultural Research, Pusa, in respect of the tropical regions of peninsular India or the vast agricultural tracts of the north-west could be remedied by the establishment of small sub-stations and to what extent the funds which would be placed at its disposal for the advancement of agricultural research could suitably be utilised for this purpose. A scheme was accordingly prepared by the Imperial Economic Botanist and approved by the Council for the establishment of a sub-station at the Karnal farm to facilitate the breeding and testing of strains of wheat, gram, linseed, barley, rape and mustard, oats, suitable for North-West-India and also to multiply seed locally for supply to the agricultural departments of the northern provinces and States—thus enabling these important initial supplies of new varieties to be made more cheaply than hitherto and facilitating the supply of pure seed for the renewal of seed stocks at provincial seed farms. It was also considered that post-graduate students at Pusa would benefit by acquaintance with work under a different set of agricultural conditions, in particular in a canal irrigated tract. In a number of other ways the Sub-station permits the activities of the Botanical Section of the Imperial Institute of Agricultural Research to be extended. The scheme was started with effect from October 1930. The reports for the period 1930-33 were considered by a technical committee of the Advisory Board in

August 1933 and the Committee was of the view that this sub-station has proved of value in a number of ways. For example, marked differences in the susceptibility of new strains to disease have been noticed at Karnal and at Pusa, and as a result of work at Karnal extensive trials of new hybrid wheats have been arranged in the Punjab and in the United Provinces. The Committee was also of the opinion that the sub-station was definitely of value to North-West India and would be of increasing value as its work developed. Though it falls outside the period of this report mention should be made of the fact that in view of the transfer of the Imperial Institute of Agricultural Research to New Delhi, consequent on the damage done by the earthquake in 1934, there will be a sub-station of the Imperial Institute of Agricultural Research at Pusa when the transfer to New Delhi is effected.

(v) *"Quality" in crops.*—Work on this scheme is to be carried out in the Bio-chemical Department of the Indian Institute of Science, Bangalore, in co-operation with the Paddy Specialist of the Madras Department of Agriculture at Coimbatore. Among the various aspects of the problem to be studied, the following are some of the more important:—(i) the influence of season, soil conditions and manuring on the chemical composition and nutritive value of rice; (ii) the effect of breeding for increased yield on the nutritive value and sustaining power of the grain; (iii) duration of growth in relation to the composition and quality of rice and (iv) the effect of storage and par-boiling on the nutritive value of rice. Financial sanction has recently been given and it is expected that work will be started shortly.

(vi) *Malting and brewing tests of improved barleys.*—The Council was approached by the Government of the United Provinces with a request for a grant for investigations into the malting and brewing tests of improved barleys grown in that province. It was considered that in view of the ten per cent. preference now granted on Empire barleys by the United Kingdom there was a definite opportunity of re-establishing the export trade in Indian barleys to Great Britain as that country still consumes substantial quantities of barley imported from non-Empire countries. The Governments of the Punjab, and Bihar and Orissa also submitted similar proposals. Through the kind co-operation of the Institute of Brewing, London, and the assistance of the Indian Trade Commissioner it has been possible to arrange for the satisfactory testing of a limited

amount of experimental material including actual malting tests and a full examination of the malts. Grants have been made to cover the test fees and incidental expenses. It is of interest to note that the selected varieties from Bihar are being sent in duplicate and shipped from two ports, *viz.*, Calcutta and Karachi as earlier work has shown that the port and conditions of shipment have a material effect on the condition in which Indian barley arrives in England.

(vii) *The standardisation of single value measurements most suitable for Indian soils.*—A small grant for ten months was made by the Council to Dr. A. N. Puri (then of the University Chemical Laboratory, Lahore) for work in connection with the standardisation of methods of physico-chemical measurements most suitable for Indian soils and to make available useful data regarding various types of soils found in this country. The work has been completed and Dr. Puri has suggested certain methods which he considered suitable and these on the recommendation of the Advisory Board have been commended to local Governments for practical trial by the provincial Agricultural Chemists. The opinions of the provincial Agricultural Chemists on these methods evolved by Dr. Puri and the results of trials conducted by them are brought to the notice of the Soil Science Committee of the Advisory Board as they come in.

(viii) *Investigations on the relation between the physico-chemical properties and the fertility of soils.*—This scheme is being carried out in the University Chemical Laboratories at Lahore under the direction of Professor Bhatnagar. Work started in December 1931. Investigations are in progress in two directions:—(i) the relation of physico-chemical factors to the fertility and productivity of soils in general and (ii) the causes of the infertility of certain barren soils in Kalabagh. In order to conclude the field plot tests at Kalabagh and to extend observations on the relation of physico-chemical factors to the fertility of soils an extension of the scheme, which was due to terminate in December 1933, has been sanctioned to the end of June 1934.

(ix) *Investigation on the Organic constituents of Indian soils.*—This scheme which is really a portion of the scheme of soil research, put forward by Dacca University in 1929 and modified at the suggestion of the Advisory Board was sanctioned by the Governing Body in October 1932 but it was only possible to allocate funds during the current year. In addition

to some preliminary work on methods of analysis an attempt will be made to ascertain if any correlation exists between the Carbon-Nitrogen ratio and the fertility of Indian Soils, the source of the organic matter in the soil and the transformations undergone by the various constituents of the added organic matter also the effect of temperature isolation, bacterial action and superficial tillage on the depletion of the organic matter.

(x) *Effect of the various 'ions' on plant growth.*—Interesting results were obtained by Dr. Bhatnagar on the effect of small quantities of certain metallic ions on wheat and gram plants when grown in water culture. Silver ions were found to make gram plants more resistant to excessive cold, or frost, and copper ions were helpful in the production and subsequent early maturation of wheat. Several other ions which are ordinarily toxic to certain plants proved to be growth-promoting when applied in tiny quantities, notably the ions thorium, zinc and barium for wheat and thorium, manganese and cobalt for gram. A small grant was given by the Council to enable this work to be extended to wheat, gram and cotton under field conditions in the Punjab. Two progress reports have been received describing in detail experiments dealing with the influence on plant growth of fifteen ions including thorium, uranium, zinc and manganese which have been found to accelerate growth. In order to enable Dr. Bhatnagar to complete and work out the results of his experiments with cold weather crops the Governing Body of the Council sanctioned the extension of the scheme in question up to the end of May 1934. The final report is now under preparation.

(xi) *Research into properties of colloid soil constituents.*—This investigation is carried out in the Chemical Department of the University College of Science, Calcutta, under Professor J. N. Mukerjee and work started in October 1930. Investigations are being caried out on the following colloidal systems :—

(*a*) Aluminium hydroxide,

(*b*) Silicic Acid,

(*c*) Humic acid,

(*d*) The acid clay colloids.

In addition the nature of colloidal solutions of palmitic, stearic, p-toluic and other similar sparingly-soluble acids is also under study. The effect of time of reaction, temperature, ultra-filtration, age-ing and reaction with acid, alkali

and neutral salt solutions on these colloidal systems form part of the investigation. The following papers have been published in the Indian Journal of Agricultural Science :—

1. On the Nature of Reactions responsible for Soil Acidity, Part I, on the titration curve of Acid clay. (Vol. I, Part II, April 1931.)
2. On the Nature of Reactions responsible for Soil Acidity, Part II, Titration curves of Silicic Acid Sol, Humic Acid Sol and Aluminium Hydroxide Sol. [Vol. II, part (VI)—Dec. 1932].
3. On the Nature of Reactions responsible for Soil Acidity, Part III. (Vol. IV, Part IV, Aug. 1934).

The detailed annual reports on the investigation have been considered by the Soil Science Committee of the Council and, with the Committee's reports, by the Advisory Board. Both bodies reported that fundamental work in soil science of real value was being carried out. Towards the close of the year a proposal for an extension of the scheme for a further period of three years with effect from the 1st October 1935 has been received for work on the following problems :—

(1) An extension of the enquiry on the acidic properties of the individual soil constituents;

(2) The manner in which the individual properties of these substances are affected by their mutual admixture, by the presence of sesquioxides and by electrolytes; and

(3) Other characteristic colloidal properties of the colloidal complex and other constituents of soil.

This extension was recommended both by the Soil Science Committee and by the Advisory Board.

(xii) *Preparation of cheap synthetic manure from town refuse and waste materials.*—The objects of the investigation which is to be caried out at the Indian Institute of Science are to prepare out of town refuse, and waste materials in general, a cheap but useful manure which will (*a*) be formed, in a short period of time under aerobic conditions in presence of suitable chemical and biological starters, (*b*) contain all the nitrogenous and mineral compounds, originally present in the material or added to it in readily available form; the method should (*c*) help indirectly in rendering rock phosphates and

other resistant minerals, readily available for plant nutrition (*d*) be repeatable at all seasons of the year and under various climatic conditions even in the hands of unskilled labourers and (*e*) be clean, hygienic and at no time, a source of danger to public health. Financial sanction has been conveyed very recently and the scheme will start during the year 1934-35.

(xiii) *Investigations on the Chemistry of Malting* Cholam (*Sorghum*).—The industrial and commercial utilisation of *cholam* in the preparation of malt foods, designed to replace the imported product, was under investigation by the Government Agricultural Chemist, Madras. Though promising results have been obtained more exact information on several points is required and further investigations will include :—

(*a*) a re-examination of the changes which the carbohydrates undergo and of the agencies responsible for these changes;

(*b*) a study of the nature of the fats present in *cholam* grain, the changes which these undergo during malting and means of reducing their effects to a minimum; and

(*c*) a study of the nature of the changes which the proteins undergo during malting and the enzymes concerned in the process.

Financial sanction to the scheme has only recently been conveyed and work has not yet started.

(xiv) *Dry-farming schemes—Madras, Bombay-Deccan, Hyderabad and Punjab.*—As stated in paragraph 9 (*i*) of the report for the year 1932-33 the object of these schemes is to devise methods of soil-management and to select or breed strains of crops which will enable crop production to be carried on with a greater measure of certainty and security in tracts of limited and precarious rainfall. Steady progress has been made with the Madras and Bombay schemes during the year. The question of a suitable station for the Punjab work has not yet been settled.

(xv) *Fruit schemes—Madras, Bombay, Bengal, United Provinces, Punjab and Bihar and Orissa.*—This co-ordinated group of schemes of work on fruit culture, which was described in considerable detail in paragraph 9 of the Annual Report, 1932-33, aims at the production and propagation of improved varieties and stocks, work on the uniformity of bearing, yield

and quality and work on better selection of varieties for commercial production and improvements in the methods of marketing of fresh fruits. Work has recently been started on all the schemes.

(xvi) *Potato-breeding.*—This scheme which is carried out at the Madras Agricultural Department's special potato farm at Nanjanad in the Nilgiris (elevation 6,500′) was sanctioned in October 1932 and work started in June 1933. The object is to produce new varieties of potatoes suitable for various parts of India by the raising and testing of seedlings and the production of hybrids as well as by the acclimatisation and testing of imported varieties. Through the co-operation of the Imperial Bureau of Plant Genetics, Cambridge, it has been possible to obtain for this Station, and for the Imperial Economic Botanist who is carrying out work in Northern India, small quantities of material of other species of Solanum which recent research in Russia and elsewhere has shown to be of special importance in potato breeding. More recently a small quantity of seed of some of these species and an important hybrid have been obtained through the kindness of the Institute of Plant Industry, Leningrad Academy of Science, with which the Council has established exchange relations. The progress report shows that at Nanjanad a considerable number of well-known varieties flower well and several produce viable pollen; a number of seedlings have already been obtained. Any new varieties produced which promise to be of economic value will be distributed throughout India for testing.

(xvii) *Provision of a Physical Assistant on the staff of the Agricultural Chemist, Bengal.*—This appointment was sanctioned as a corollary to the Dacca University research scheme on lateritic soils to enable the Agricultural Chemist in Bengal to carry out more fully a programme of soil research the results of which should be of general value. The programme includes :—

(1) Soil moisture, the means by which it is retained by different soils, and the respective capacities of the latter to deliver soil moisture to support plant growth; maximum capacity of retention.

(2) How the retentive capacity of the various soil types is affected by soil temperature at various times of the year.

(3) The relation between soil moisture and the plant as influenced by—(*a*) addition of soluble fertilisers, and (*b*) addition of lime to acid soils.

(4) The influence of the more common crops on moisture content and the minimum moisture content required to produce a normal yield.

(5) Rate of evaporation.

(6) Incidence of rainfall and its effect.

(7) Capillary action.

The results obtained during the year 1932-33 may provisionally be summarised as follows :—

(*a*) At Dacca the loss of moisture during the dry season, due chiefly to evaporation, is the greatest and is very rapid in the first three inches and then gradually decreases up to a depth of about 18 inches.

(*b*) The lower layers appears to have more affinity for moisture.

(*c*) Below a depth of 18″ to 30″ the soil moisture seems to remain more or less constant.

(xviii) *Research on the water hyacinth in Orissa.*—In April 1930 the Council sanctioned a scheme of research work on water hyacinth by Professor P. K. Parija, Professor of Botany, Ravenshaw College, Cuttack, for a period of one year in the first instance. As the work could not be completed within that period and valuable results were being obtained, the scheme was extended to the end of July 1932. The results of the physiological investigations undertaken by Professor Parija were considered by a technical sub-Committee of the Advisory Board of the Council in February 1934. The Committee considered that the questions which the scheme intended to investigate had been successfully answered and that the effect of reproduction by seeds on the eradication of water hyacinth has been definitely established. An article entitled "Physiological Investigations on the Water Hyacinth, *Eichhornia Crassipes*, in Orissa with notes on some other aquatic weeds" has been published in the *Indian Journal of Agricultural Science*, (Vol. IV, Part III—June 1934). In view of the keen interest evinced by the public in these experiments a popular summary of Professor Parija's final

report is under preparation. In the meantime the following extract from the report is of interest :—

Results of Practical Value.

"1. From field observations and experiments in the garden it was seen that the water hyacinth sets seeds only in the autumn, *i.e.*, in October and November. This fact is of great practical value. It has been the practice so far to search out seedlings during the early rains on account of the fear that the pest left undisturbed may be a source of danger. The weed really becomes a perennial source of danger when it produces and discharges seeds into the mud. As the difficulty of distinguishing seedlings from other weeds is great, the weed may be left undisturbed till the middle of the rains and then cleared as the plants can then be easily located. In consequence of this finding, now the executive officers have been asked to see that the tanks are cleared before the end of September.

2. The seeds lie dormant under water and mud for five years at least and do not germinate without access of oxygen. If the tanks do not dry up the seeds cannot get the necessary oxygen for germination. Thus seeds may be prevented from germinating by flooding tanks. Seeds on tank sides lie buried in mud and when a shower of rain exposes them, they germinate freely, and this process goes on from year to year as more and more seeds get exposed. It has been suggested that quick germination may be effected by ploughing up tank sides and thus free them of the water-hyacinth more quickly. But it is very doubtful if this will be of any practical value.

3. Experiments were carried on the effect of hydrogen ion concentration. The conclusion drawn from the experiments is of considerable importance. There is an optimum concentration for growth of the plant. Any change to either side of the optimum checks the growth but does not kill the plants completely. If the concentration changes

towards the optimum, as it is likely to do in nature, the plants grow again. Occasional spraying, therefore, with suitable fluids is of no avail against the pest.

4. Experiments with copper sulphate proved most effective. A very low concentration (0.018%) proved injurious to the plants, but it was found that even in strong solutions all the plants were not killed. The reason was found to be the antogonism to $CuSO_4$ of calcium salts liberated by the decaying water-Hyacinth plants. This explains why sprays have not been always successful. The lesson from this is that vigilance and mechanical clearing is still necessary even after poisoning the plants.

5. Investigations into the drought resistance of water-Hyacinth settled on land showed that the plant has the capacity of producing long roots with the progress of drying of the mud on which it settles. The only effective method to deal with plants settled on the tank sides is to plough them up and expose the roots and thus destroy them.

It is a common experience in these parts that the aquatic weed Pistia succeeds in most tanks cleared of water-Hyacinth. Although it was found that Pistia does not cut off light so completely as a thick growth of water-Hyacinth does, still a thick growth of Pistia is obnoxious

Experiments both in the garden and the field showed that Pistia can be effectively cleared by spraying with kerosene or better with a mixture of kerosene and $CuSO_4$. Sprayed with kerosene the plants spread, sink and rot while $CuSO_4$(0·06%) makes the roots fall off, thus killing the plants.

6. The same methods can be used effectively against the Water-fern, Sal vinia, which forms matted growth in shallow stretches of water in these parts."

(xix) *Investigations into the 'Rust' diseases of wheat and barley.*—This scheme is being carried out by Professor K. C. Mehta, Ph.D., of Agra University with a special staff. The

Council's grant has enabled a temporary laboratory to be maintained in Simla throughout the year and additional equipment to be provided at Agra. Acknowledgment should be made of the valuable co-operation received both from the Agra University and from the authorities of the Agra College. The Council is also indebted to the Nepal Government for the facilities granted to Dr. Mehta's scientific assistant from time to time which enabled observations to be made in Nepal territory. The scheme includes:—(*i*) The survey of the regional distribution of the five cereal rusts in India including the location of places in the near neighbourhood of all important areas of wheat and barley cultivation where 'over-summering' of rusts is likely; (*ii*) a thorough survey of the *Berberis* situation in the hills and a study of the suspected connection between *B. vulgaris* or *B. aristata* and black rust as well as between certain species of *Thalictrum* and the brown rust of wheat in nature; (*iii*) a complete study of the physiologic forms of these rusts and their distribution in the different hills as well as the plains; and (*iv*) a study of rust dissemination. The scheme has been in progress for about four years and as a result of the investigations the distribution of the three wheat rusts in India has been ascertained, and number of different physiological forms of wheat rust fairly well settled, the problem of 'over-summering' largely solved and the difference in the part by the Himalayan and European Berberry in rust dissemination established. It has been shown that the number of physiological forms of the wheat rusts found in India is small and as the distribution is now fairly well-known the breeding of wheats resistant to specific physiological forms can now be started. Since the close of the year under report proposals have been received for an extension of the scheme for a period of three years from April 1935, with the object of completing the work mentioned above and starting the breeding of resistant strains of wheat.

(xx) *Virus diseases of Plants.*—A scheme of co-operative investigation between Dr. B. N. Uppal, Department of Agriculture, Bombay, and Dr. V. N. Likhite, Department of Agriculture, Baroda, into the virus diseases of three crops, namely, Chillis, Cardamoms and *Bhindi* was approved in 1931 but was postponed on account of financial stringency. In view of the recent advancements of knowledge of the virus diseases and the constant introduction of new technique it

was considered advisable to take advantage of this postponement to depute Dr. Uppal for special training and advanced study in Europe and America for about a year. This proposal was approved by the Council. Dr. Uppal has recently returned from his deputation.

(xxi) *Wither Tip disease of Citrus fruits.*—Work on this scheme, which was carried out at the Punjab University Laboratory at Lahore under Dr. H. C. Chaudhuri, University Reader in Botany, was started in 1931. It included :—(*i*) field observations regarding the incidence, spread and virulence of the disease in different localities; (*ii*) cultural studies of the casual organism in the laboratory; (*iii*) inoculation experiments for testing the susceptibility of different species and varieties of citrus plants to the different strains isolated and (*iv*) control experiments. Some definite results have been obtained as a result of two years' work and the scheme has been extended for a period of four months to enable Dr. Chaudhuri to complete certain systematic work at the Imperial Mycological Institute, London, to visit the Citrus Cultivation Stations in Italy and the Culture Bureau at Baarn. The final report is now under preparation.

(xxii) *An electric method of hygrometry.*—A few years ago it was discovered in the course of Professor Seth's researches in Lahore that the electrical resistance of a carbon line drawn on a suitable surface changed with the humidity to which it was subjected. It was considered that this form of hygrometry, if developed on appropriate lines might prove especially suitable in agricultural and entomological research. Such humidity controllers might also prove useful in fruit and food preservation work. The scheme has only recently received financial sanction and work has not yet started.

(xxiii) *Mechanical cultivation.*—At its meeting held in August 1933, the Advisory Board of the Council expressed appreciation of the experimental work carried out by the Burma-Shell Corporation and emphasised the great desirability of continuing certain experiments for at least one more season. Particular importance was attached to experiments on the best type of plough-share for weed eradication, especially in black soil areas, and to further data on the working life of tractors. In response to the firm's request, the Council agreed to share with them the further expenditure that would be incurred on these experiments during the season 1933-34 up to a maximum of Rs. 7,000. The results of the Burma-Shell

experiments are under publication by the Council as a monograph—and arrangements have been made to include the results of the 1933-34 experiments as an appendix. It is sufficient to say here that the monograph will now provide most valuable data on the conditions necessary to the successful use of tractors in India, the cost of different forms of mechanical cultivation under various conditions, and on the economic working life of both tractors and implements.

(xxiv) *Statistical Studies relating to Agricultural Research in India (Professor P. C. Mahalanobis, Presidency College, Calcutta)*.—This scheme was started in July 1931 and its extension for a period of five years from July 1934 was sanctioned during the year under report. The scheme of work included (*i*) Statistical investigations on experimental errors in field trials with special reference to the study of small samples drawn from 'skew' populations; (*ii*) the examination of the effects of rain-fall on the yield of selected crops using the methods elaborated by Dr. Fisher at Rothamsted; (*iii*) a statistical study of the partial and joint influence of several meteorological elements on the yield of important crops and the actual work so far done may be classified under three heads :—

(1) Mathematical studies including preparation of statistical tables;

(2) Special courses of training in statistics for Agricultural officers sent on deputation for this purpose;

(3) The application of statistical methods to the solution of various questions forwarded by Agricultural Officers, including the analysis of experimental data, the scrutiny of papers and research schemes and the preparation of designs for new experiments. With the development of the scheme of research in agricultural meteorology carried out under the direction of the Director General of Observatories at Poona, and the provision of a small statistical section at the Headquarters of the Council to deal specially with the planning and interpretation of field experiments, a careful co-ordination of programme of work was found desirable. Work at Calcutta is now being concentrated merely on

statistical research and the mathematical handling of biological data and on the training of post-graduate students and agricultural officers on deputation.

(xxv) *North-West Frontier Province Entomological Survey Scheme.*—This scheme includes :—(*i*) a survey of the insect pests of fruit trees in the North-West Frontier Province with special reference to the present distribution of San José Scale and its host plants; (*ii*) the examination and fumigation of live plants entering India at Peshawar and Parachinar; and (*iii*) the examination for insect pests of fruit entering India through Peshawar and the Kurram Valley. Financial sanction to the scheme has only recently been conveyed and work on it has not yet started.

(xxvi) *Agricultural Meteorology.*—No-where is the general connection between the weather and agricultural production better recognised than in India where the area which it is possible to sow is so largely determined, directly or indirectly, by the course of the monsoon and the yield per acre by the weather conditions generally. There is still great need for accurate data and especially for a detailed study of what is sometimes termed the "micro-climate" or the meteorological conditions immediately surrounding the growing crop.

This scheme of work in agricultural meteorology is carried out at Poona with a small special staff under the Director General of Observatories. Though sanctioned in July 1930, financial stringency prevented funds being allotted until August 1932, and even then a start had to be made on a considerably reduced scale; work started on the 22nd August 1932.

The first annual report on the working of the scheme was considered by the Advisory Board in February 1934, and a number of suggestions communicated to the Director General of Observatories. Work in progress includes a statistical study of the relations between various meteorological data and crop yields, a statistical analysis of meteorological factors for purposes of forecasting temperature, frost-forecasting temperature, and a study of instruments and methods for micro-climatological observations for use by biological investigators.

13. *The Technology of vegetable oils.*—In May 1933 the Government of the United Provinces approached the Council with a proposal that the Council should take over the vegetable oil department of

the Harcourt Butler Technological Institute and make it an all-India Institute under its own administrative control. The reason advanced for the proposal was that this section of the Harcourt Butler Technological Institute already served the needs of several provinces and the Local Government were unable to maintain this section on its present scale and owing to financial considerations, were seriously thinking of closing it down altogether. The proposal received careful consideration of the Council and it was considered that the scheme, should eventually be financed from the proceeds of the proposed cess on oilseeds if that proposal materialises. In view, however, of the importance of the Oil Department of the Institute, the importance of the vegetable oil industry to Indian agriculture and the urgency of the case the Council have sanctioned a temporary grant of Rs. 30,000 to be given during the year 1934-35 which supplemented by a substantial contribution from provincial funds has enabled the Local Government to run the oil section for another year. In return the United Provinces Government have agreed to admit to the Oil Section of the Institute during the year 1934-35, seven free scholars nominated by the Council from other provinces—five for the diploma course and two for a short term oil course.

14. *Hyderabad Castor Breeding Scheme.*—The average acreage under castor in the H. E. H. the Nizam's dominions is believed to be about one half of the total acreage under castor in India and Hyderabad thus produces a very large proportion of the castor grown in the world. In view of the importance of this crop to this State, and of the successful work already done there by the Hyderabad Agricultural Department, the Council has sanctioned a grant for research work on the improvement of the castor crop. The following breeding and cultural work will be undertaken :—

Breeding.—(1) Isolation and subsequent testing of the unit species from the various varieties of castor grown in India; (2) analysis of the factors which make up yield such as the branching habit, the number of male and female flowers in each spike; (3) a study of the variation of oil content from plant to plant within a selected strain, from spike to spike on the same plant and from seed to seed in the same spike; and (4) a study of pollination in castor.

General.—(1) Study (largely by post cultures) of the influence of environmental factors, such as soil moisture manures, air temperature, etc., on the nature of the flowers produced and

yields of seed and oil content obtained; (2) Determination of the best time for sowing and (3) determination of the most suitable spacing for different types of castor.

The scheme involves a total expenditure of Rs. 61,000 spread over a period of five years and work has been started from the beginning of April 1934.

15. *Oil Seeds Committee.*—At the third meeting of the Indian Oil Crushing Industry Committee to which a brief reference was made in paragraph 10 of the Report for the year 1932-33 a number of problems connected with the development of the Indian Oil Crushing Industry were discussed. The recommendations made at this meeting will be found in Appendix IV. Action on most of these has already been taken but a few important proposals were still under examination at the end of the year. Applications have been received for grants to the oil industry section of the Harcourt Butler Technological Institute, Cawnpore, and to the Kerala Soap Institute, Madras, and in both instances arrangements are proposed for technological research and technological assistance to the oil crushing industry. As mentioned above the Council has sanctioned temporary financial assistance of Rs. 30,000 during 1934-35 to the Harcourt Butler Technological Institute to enable the Government of the United Provinces to continue the section of Oil Technology.

16. *Linseed—Weekly circulars.*—As the result of recommendations from the Oil Seeds Committee and Advisory Board special arrangements were made with the High Commissioner for India, London, with effect from the 20th July 1933, for a weekly cable containing current prices and a report on market conditions of Indian and Argentine linseed and linseed oil in London. This together with other trade information on the course of prices of linseed in India, monthly reports from the Argentine and other useful information regarding linseed in foreign countries is issued every week as a circular. That these circulars have become popular is evidenced from their wide circulation. The present distribution list is given in Appendix V.

The Council has issued, for the use of oil crushers in India, a pamphlet containing information regarding the standards of quality required by the London and Continental markets for certain oils and oil-seeds and has under compilation a bulletin for oil-crushers and others on a number of technical and commercial details. The attention of Local Governments and

Indian States was drawn to the preferences granted under the Ottawa Trade Agreement on Vegetable oils and certain oilseeds and to the desirability of developing to the fullest extent possible the advantages arising out of these preferences. As a result several research schemes for the improvement and better utilization of oilseeds have been submitted and these will be considered by the Oil Seeds Committee at its next meeting. The question of encouraging cotton-seed crushing in India was considered at the last meeting of the Committee and it was pointed out that one difficulty which lay in the way of developing this industry was the regular disposal of the cake for which there is no adequate demand in India so that firms had often to depend on foreign markets for its sale. As recommended by the Committee the provincial departments of Agriculture have been addressed on the possibility of creating a demand for decorticated cotton cake by means of extensive experiments in departmental farms, propaganda and demonstration. If there is sufficient demand for cotton-seed cake for these purposes the Council expects to make arrangements for the installation of a decorticator at the Harcourt Butler Technological Institute and for the supply of decorticated cotton seed cake for experimental and demonstration purposes at a contract price.

17. *Proposed Cess on oilseeds.*—With the limited funds at its disposal the Council is not in a position to incur more than a fraction of the expenditure on research, technological assistance and the supply of information which is necessary for the development of the oil crushing industry, important as it is to Indian agriculture. Indeed some of the expenditure needed is perhaps somewhat outside the Council's ordinary sphere of operations. A proposal to raise funds for this purpose by a cess and the formation of a Central Committee somewhat on the lines of the Indian Central Cotton Committee is now under consideration and the views of the trade, industrial and agricultural interests will be invited.

18. *Fertilisers Committee.*—Reference was made in paragraph 9 of the report for the years 1929-30 and 1930-31 to the appointment of a Fertilisers Committee to deal with the investigation of problems relating to the conservation of indigenous manurial resources and the development of the use of indigenous fertilisers. The Committee held its second meeting in February 1934. A statement is attached (Appendix VI) which shows the recommendations made by the Committee at this

meeting and the action taken on them. This meeting of the Committee was mainly occupied with a consideration of the tabulated results of past fertiliser experiments and the report of the Statistician to the Council on their statistical significance. These results are now being published. It may be noted that the Committee was unanimously of the opinion :—

> "That the survey of manurial experiments carried out in India establishes the importance and suitability of indigenous organic manures like cattle manure, green manures, bone-meal, fish manure, and oil cakes"; and
>
> "That artificial fertilisers give the best results in conjunction with organic manures or in the presence of adequate supplies of organic matter in the soil".

The Committee also drew up a comprehensive programme of manurial experiments in order of importance and made several other recommendations which were under consideration at the close of the year.

19. *Coconut Enquiry in India.*—In the last year's report mention was made of the enquiry into the supply of coconut products and coconut oil in India in order that the real facts of the position in South India might be obtained. Dr. J. S. Patel the special officer appointed to conduct the enquiry visited most of the important coconut growing districts in India and Ceylon to study at first hand the economics of coconut production with special reference to :—

(i) The prices now obtained by the cultivators for coconuts and coconut products;

(ii) The prices paid for copra by oil crushers in South India;

(iii) The extent to which the coir industry interferes with the copra supply;

(iv) Whether the shortage of coconut products in South India is local or general, if the former, the difficulties in getting supplies to the crushers;

(v) The extent of the increase of coconut cultivation during the last few years;

(vi) The area of new coconut garden not in bearing;

(vii) The extent of first class coconut land already planted and the scope there is for expansion;

(viii) The cost of cultivation and general agricultural practices;

(ix) The yields of coconuts in different tracts in various conditions.

The special officer submitted his report at the close of the year and the recommendations contained therein fall within the purview of the annual report for 1934-35.

20. *Cost of production of crops in India.*—The enquiry into the cost of production of crops in the principal sugarcane and cotton growing tracts in India which is financed jointly by the Imperial Council of Agricultural Research and Indian Central Cotton Committee started in most of the provinces and the States concerned between the 1st of April and the 31st of June 1933, the dates varying according to the convenience of each. In Bihar and Orissa and Bengal, however, work did not begin until the beginning of September, 1933. In all provinces and States, except Bengal and Bihar and Orissa, work was started at a time when the preliminary cultivation for the first important crop (mainly cotton) to be included in the enquiry was fairly advanced, and when in some cases, sowing had already begun. For that portion of the data therefore, there was no alternative but to depend upon such information as could be gathered by observation and on the information supplied by the cultivators themselves. At the outset most cultivators, it may be said, were antagonistic to the idea of the enquiry and were suspicious that the ultimate object was to raise their land revenue. Some indeed refused all co-operation and due to this difficulty it was found necessary to re-select some of the holdings in certain villages after the enquiry had been carried on for a considerable time, whilst in one or two instances the entire village had to be abandoned. At the same time, the Village Investigators and the District Supervisors, being new and not sufficiently trained in their jobs, had considerable difficulty in collecting and recording the data. Due to the co-operation of the staff, all these difficulties, which were certainly present and in some cases were anticipated, have now been overcome and the work is proceeding smoothly. But it will be realised that the first year's data though fairly reliable are imperfect in some respects and must only be taken as preliminary.

Before work was commenced in the Provinces, Mr. Kapur, the Chief Economist met the Provincial Officers at an informal

meeting at Nagpur, in March 1933, for a preliminary discussion and explained to them the various technical details involved in the enquiry. The object of this Conference was to secure uniformity in methods throughout the provinces. A few months after the starting of the enquiry, Mr. Kapur made extensive tours in India to note the progress of the work to answer questions and to suggest solutions to the Provincial Officers and District Supervisors wherever they had any difficulty. As there were not many important items for discussion no meeting of the Joint Sub-Committee was called during the year under review.

The agricultural year 1933-34 can hardly be said to have been normal. Excessive rains and inundations, in some districts and frosts in others, complicated work. At the close of the year the tabulated data for the *Kharif* crops of 1933-34 had not been received but began to arrive shortly after. The discussion of these and of the recommendations made by the Joint Committee will be dealt with in next year's report.

21. *Sugar*—

(i) *Sugar Committee*—

(a) *Personnel.*—During the year the Director of Agriculture, Mysore, and a representative of the Department of Agriculture, Bengal, were appointed as members of the Sugar Committee. An up-to-date list of members of the Committee will be found in Appendix VII.

(*b*) *Sixth Meeting.*—The Sugar Committee held its sixth meeting at Coimbatore in November 1933. The recommendations made by the Committee and the action taken on them are shown in the statement at Appendix VIII.

(ii) *Grant for sugar research, 1934-35*—

The Government of India made a grant of Rs. 2½ lakhs for expenditure on sanctioned schemes of sugar research during the year 1934-35. For want of funds, however, it has not yet been possible to give financial sanction to the two schemes mentioned below which were sanctioned by the Governing Body in November 1933.

(*a*) Application from the Government of Burma for a grant of Rs. 11,200 spread over a period of three years for a scheme of research into parasites to control the beetle pest of sugarcane in Burma.

(*b*) Application from the Government of the North-West Frontier Province for a grant of Rs. 64,250 spread over a period of five years for a scheme of sugarcane research in the North-West Frontier Province.

(iii) *Sugar Conference, 1933*—

Among the other important matters relating to sugar may be mentioned the Sugar Conference convened by the Government of India, (Education, Health and Lands Department), in Simla early in July 1933. The technical and statistical information required was supplied by the Sugar Technologist and by the Imperial Council of Agricultural Research Department.

The Sugar Cane Act was passed by the Central Legislature at the end of the 1934 budget session and has since received the assent of the Governor-General in Council and become law. It empowers local Governments to make rules and regulations to ensure the payment by sugar factories of a minimum price for sugarcane purchased in controlled areas. The minimum prices fixed are subject to the control of the Governor-General in Council. The object of this Act is to secure to the grower a fair price for his cane, relative to the price of sugar, and fair treatment in regard to weighments and similar matters; —in other words to secure to him a fair share of the benefits enjoyed by an industry which was granted protection largely in the interest of the agriculturist.

22. *Sugarcane Research.*—In its Interim Report, 1929, the Sugar Committee emphasized the need for the establishment of a chain of research stations throughout the main sugarcane belt in Northern India to enable new seedling canes to be fully tested and studied in sub-tropical India as soon as possible. The Committee's original scheme included a station in North Bihar one in Gorakhpur District, the existing provincial station a Shahjahanpur, a station in the Meerut Division, the Sub-station of the Imperial Cane Breeding Station at Karnal and a Punjab Station, which the Committee recommended should be in the Central Punjab, with the existing Punjab experimental farm at Gurdaspur as the north-west limit.

The primary work which the Committee had in view for this chain of stations was the testing of new varieties of cane and the constant recording of the behaviour of standard varieties, especially of those recently established in cultivation, with

special reference to their behaviour towards diseases and pests and their suitability to local methods of cultivation. It was considered that, as central factories increase, changes in the varieties grown would probably be desirable. The question of testing cannot therefore be divorced from the question of breeding in sugarcane work, especially as vegetative re-production renders unnecessary much of the selection work after a hybrid has been created which is necessary with crops reproduced from seed. Hence adequate and early testing is second in importance only to the production of improved seedlings. The study of cultural methods and manurial requirements was included in the work of these research stations because it is not possible to divorce these from variety-testing and the breeding question since both the manure and water supply have necessarily to be taken into consideration in selecting a new variety for introduction.

The Council has sanctioned grants for a chain of eight research stations in Northern India and added to these three others, *viz.*, one for the Bombay-Deccan, one for Madras and one for Mysore. A brief account of each of the sanctioned schemes is given below from which it will be seen that they all form part of a considered programme of work in pursuance of a definite general policy.

Owing to the importance of the sugarcane crop to the agricultural development of the North-West Frontier Province a scheme for research work has been approved for that province also, and a small grant promised for work on the bettle pest of the cane crop in Burma. These schemes have not however been started yet owing to lack of funds.

(*i*) *Punjab Sugarcane Scheme.*—This scheme forms part of the general scheme of testing stations in the Principal sugarcane belt of Northern India and was sanctioned after considerable modifications had been made on the recommendation of the Sugar Committee.

The scheme was started only in 1933 and no progress report has yet been received. As finally sanctioned there are now two testing stations in this scheme, *viz.*, one at Risalewala near Lyallpur and one at Jullundur in the Central Punjab.

(ii) *Shahjahanpur Farm Trials.*—On the recommendation of the Sugar Committee, and as part of the general scheme for testing new seedling canes, a grant of Rs. 6,000 was made to the United Provinces Government in December 1930 for the

detailed examination at Shahjahanpur of complete sets of cane seedlings from new hybrids made by the Imperial Sugarcane Expert. Two technical reports on the trials have been received; work is being conducted in close co-operation with the Imperial Sugarcane Expert who has been supplying the seedlings—as also actual cane seeds for germination and subsequent growth at Shahjahanpur. The experiments are being continued the object being to speed up the provision of improved canes and their introduction into cultivation.

(iii) *Bihar and Orissa Sugarcane Research Scheme.*—Work was started at the Mushari Sugarcane research station, in the Muzaffarpur District of North Bihar in April 1932; a substation was opened at a later date at Patna. The main problems under investigation relate to the selection of more suitable varieties of cane for the different areas in the province (including irrigated and water-logged areas and *usar* soils), the evolution of disease-resistant types and the selection of early and late maturing varieties. The first annual report for the year 1932-33 was examined by the Sugar Committee of the Council which was satisfied that the work was being conducted on sound lines and in close co-operation with the Imperial Institute of Agricultural Research, and the Imperial Sugarcane Expert. The work done included studies on (1) germination in relation to soil, temperature and method of planting; (2) the growth of the root and leaf blade; (3) rhind hardness and pith cavity; and (4) the chemical characters of the seedlings under test.

This research station suffered considerable damage as a result of the earthquake of 1934 and work was interrupted. An additional grant was made to enable the land to be cleared of sand deposits as quickly as possible and to minimise the break in continuity of experimental work.

(iv) *United Provinces Sugarcane scheme.*—More than half the sugarcane area of India is situated in the United Provinces which has three well-defined sugarcane tracts each with an area of cane comparable with the total area in each of the adjacent provinces. In this province also the greatest expansion of the factory sugar industry has taken place. Much good work had been done at the Shahjahanpur Research Station but a single station was obviously inadequate for an area exceeding 1½ million acres of cane. The original scheme put forward by the Local Government provided for detailed work on not only

the agricultural but on the technological and economic problems involved. The second was found to be covered by the programme of the Council's Sugar Technologist who has headquarters at Cawnpore with a sub-station in the Moradabad District; the last by the Council's enquiry into the cost of the production of crops in the principal sugar cane and cotton tracts. Reference has already been made to the Shahjahanpur Research Station and the extension of its activities. For dealing with the problems of the north-west of the province a research station has recently been established at Muzaffarnagar with the aid of a grant from the Council.

(v) *Dacca Sugarcane Testing Station.*—A sugarcane seedling testing station in Eastern Bengal was included in the Sugar Committee's general scheme, in view of the growing importance of sugarcane cultivation in Bengal and the need for better varieties. Work was started in November 1931 and progress reports on the work done during the years 1931-32 and 1932-33 have been received by the Council and examined by the Sugar Committee.

(vi) *Sugarcane Sub-station at Karnal.*—In its interim report, 1929, the Sugar Committee recommended for adoption a scheme prepared by the Imperial Sugarcane Expert for the establishment at Karnal of a sub-station of the Imperial Cane Breeding Station at Coimbatore. The main object of the scheme was to give greater scope for the testing of Coimbatore seedlings under sub-tropical conditions, without a preliminary sorting at Coimbatore and to enable the Imperial Sugarcane Expert to obtain more detailed knowledge of growth conditions in North India; also to explore the possibilities of obtaining viable seeds and of effecting crosses at Karnal and to study the best methods of transporting plant breeding material from Coimbatore to Northern India. The two annual reports have been examined by the Sugar Committee which approved the lines of work adopted and made some suggestions regarding future reports.

(vii) *Extension of sugarcane work at the Jorhat Experiment Station, Assam.*—As part of the general scheme of sugarcane research stations in Northern India, a proposal for the extension of sugarcane work at the Jorhat Experiment Station in Assam was sanctioned by the Council early in 1933. The scheme was actually given effect to from August 1933 and the progress report on the work done during the first year of its working is awaited.

(viii) *Madras Sugarcane Research Scheme.*—In 1929, the Government of Madras considered that their needs in the matter of sugarcane research were adequately met by the Imperial Cane Breeding Station at Coimbatore and their own sugarcane testing station at Anakapalle, but later on, owing to the need for encouraging commercial crops as an alternative to paddy, the local Government considered that an expansion of the sugarcane area was likely and put forward a research scheme which after modification was sanctioned in 1933. The scheme provides for two stations, one at Anakapalle which provides for flow irrigation areas and where a provincial experimental farm already exists, and a smaller one near Chittoor for tracts under lift irrigation. The scheme includes varietal, cultural and manurial experiments, methods of reducing the cost of cane production and improvements in the manufacture of jaggery. The Anakapalle Station was started in April 1933 but work at the other sub-station has not yet been started owing to difficulty in acquiring land; a site has now been chosen at Gudiyattam in North Arcot District.

(ix) *Bombay Deccan Sugarcane Research Scheme.*—In August 1930 the Sugar Committee recommended the establishment of a sugarcane research station at a place representative of the environmental conditions obtaining in the Deccan canal zone. A detailed scheme was accordingly drawn up by the Government of Bombay for a research station at Padegaon on the Nira Right Bank Canal, which was sanctioned by the Council and started in June 1932. The programme includes fundamental scientific investigations into the reaction of the different types of Deccan Soils to irrigation, the evolution of a high class cane which is suitable for the Deccan and more economic than Pundia, the water requirements of cane and rotation crops, manurial requirements of the sugarcane rotation, improved cultural methods and the economics of sugarcane production. The annual report for the year ending June 1933 shows that a sound programme of experimental work has been laid down and satisfactory progress made.

(x) *Mysore scheme for the breeding of thick canes.*—The great possibilities of thick varieties of cane in the climatic conditions prevailing in Mysore, and the steps already taken by the Mysore Darbar for the establishment of a sugarcane breeding farm in the Irwin Canal area were brought to the Council's notice by the Government of Mysore and a small grant-in-aid was asked for research in the breeding of thick

canes for Mysore and South India generally. The scheme has been sanctioned by the Council and work started early in 1934.

(xi) *Sugar Technology.*—The improvement of the raw material was a fundamental preliminary to the establishment in India of a modern factory industry and though the first stage of such improvement has been reached much remains to be done. As the preceding pages show that side of the question is receiving a fair measure of attention. In Northern India generally, well-equipped and efficient sugar factories now obtain a recovery of 9 per cent. sugar from cane as against less than 6 per cent. in 1919-20. But despite the improvement in raw material a few factories are still doing little better than the 1919 level. The importance of properly selected machinery, well-planned factories and efficient operation can hardly be over-estimated. For these reasons the Government of India provided the Council with funds which enabled a Sugar Technologist to be appointed. A review of the Sugar Technologist's work appears in a later paragraph of the report. The *khandsari* sugar industry and the production of sugar in villages by indigenous methods is of considerable importance whilst even when the factory sugar industry develops to the extent of replacing all imports, some three quarters of the sugarcane crops will still be consumed as *gur*. The Council therefore provided the Sugar Technologist with an experimental station for the study of indigenous methods of *gur* and sugar manufacture.

(xii) *Research and Testing Station for the indigenous systems of* gur *and sugar manufacture.*—This scheme provides an experiment station, for the purpose of testing existing processes and machinery used in manufacturing *gur*, *rab* and sugar by the indigenous systems, for conducting trials with new plants and processes and for experimental work with the object of introducing improvements. One of the functions of the research station would be to provide training operatives in improved methods. The site chosen is at Bilari in the Moradabad District, United Provinces, which is a good place for sugar cane supply, a typical centre of the *Khandsari* industry and in the United Provinces Hydro-electric 'Grid' area so that cheap power is available for small machinery. Preliminary work is now in progress and operations start in the cane season of 1934-35.

(xiii) *Experiments conducted by the Sugar Technologist on the construction and testing of an improved juice boiling*

bel.—In his report on the experiments conducted in 1931, on the open pan system of white sugar manufacture the Sugar Technologist to the Council referred to the need for testing the improved *bel* which he had designed. The Sugar Committee recommended that a grant of Rs. 4,000 should be made for the purpose. This grant was sanctioned and as the intention is to have the improved *bel* tested under actual commercial conditions, the work is being done at Lala Har Sahai Gupta's farm. The experiments are still in progress.

(xiv) *Investigations into the possibilities of manufacturing khandsari sugar by the single pan method in Bihar and Orissa.*—This scheme is intended to test the economic possibilities of sugar manufacture as an alternative to gur manufacture by cultivators using the simplest and least expensive possible plant.

A small grant has been made to the Bihar and Orissa Government for the purpose and work will start during the season 1934-35.

(xv) *Research on the genetics of sugarcane at the Imperial Sugarcane Breeding station at Coimbatore.*—In recent years the study of the genetics of crop plants has assumed great importance and other countries have started work on the Genetics of sugarcane recognising the importance of such studies as an aid to cane breeding. Similar work in India was urgently necessary, especially in view of the wide range of conditions that the sugarcane breeder in India has to cater for and the climatic handicaps associated with the fact that the principal cane growing tracts in India are sub-tropical. The Council has provided funds for the addition to the staff at the Imperial Sugarcane Breeding Station at Coimbatore, of a Geneticist, with adequate experience of such work and thoroughly conversant with the latest developments in cytological technique. Work started during 1934-35.

(xvi) *Research on mosaic and other diseases and pests of sugarcane at the Imperial Institute of Agricultural Research, Pusa.*—In 1930 the Council sanctioned a five years' scheme for strengthening the Mycological Staff at the Imperial Institute of Agricultural Research, Pusa, for work on the diseases of sugarcane but owing to financial stringency the scheme was actually started, on a much reduced scale, with effect from June 1932. An intensive study of the mosaic virus wherever it occurs in India has been taken up and a new line of investigation has been developed to find out the nature of the disease.

Attention is also being devoted to other cane diseases. The first annual progress report for the year ending June 1933, was approved by the Sugar Committee.

(xvii) *Insect pests of Sugarcane.*—A revised scheme of work on the principal insect pests of sugarcane has been approved by the Sugar Committee and the Advisory Board of the Council.

(xviii) *Statistics of khandsari sugar production.*—One of the greatest difficulties experienced in estimating the total production of sugar in India is the lack of information regarding the production of sugar by the *khandsari* method which is very considerable. The United Provinces and the Punjab are believed to be the most important provinces for sugar production by the *khandsari* and other open-pan methods and the co-operation of the local Government was sought in the collection of particulars regarding the number of such sugar makers, the quantity of sugar produced annually, the area under sugarcane serving the needs of *khandsaris*, the number of villages where sugar is manufactured by the open-pan process and certain particulars regarding the various *khandsari* concerns. The Punjab Government have found it possible to obtain this information through their provincial Board of Economic Enquiry and have kindly undertaken to do so. In the United Provinces as the number of such concerns is greater and the enquiry more difficult, a small grant has been given by the Council, the work being under the direction of the provincial Director of Statistics

23. *Sugar Technologist and the Sugar Cable Service—*

(i) *Industrial and Technical.*—As a result of the impetus given to the Sugar Industry by the grant of protection, the first batch of new sugar factories commenced manufacturing operations during 1932-33 and 57 factories making sugar direct from cane in India worked during the season 1932-33 as against 32 in the previous season; of the 31 were old factories and 26 were new. One new factory has not been taken into account as being a small experimental factory for the training of students, it has a nominal and uncertain output. During the season 1933-34, 112 factories manufactured sugar direct from cane, out of which 55 represented the second batch of new sugar factories and commenced manufacturing operations during the season 1933-34. Due to the higher import duty combined with low prices ruling for gur, the number of factories refining gur during 1933, showed a marked increase. Out of the first batch

of 26 new cane factories, 10 also refined gur in the off-season, during 1933. One new refinery commenced working in the Punjab during the year 1933. Of the total number of factories in existence in 1932-33, 47 were equipped for refining gur or raw sugar. Out of these 32 were factories working with cane also and 13 were pure refineries. Of the former 16 refined gur during the year 1933, and of the latter 11 are known to have worked during the year. There were thus 27 factories refining gur compared with 17 during 1932.

During the year under report the Sugar Technologist as usual supplied advice and information regarding suitable sites for new sugar factories; specifications of machinery and schemes for factories were drawn up, tenders were scrutinized by him and technical assistance was rendered in various other ways. He inspected several sugar factories as well as visiting the provinces and an Indian State to advise on technical matters, sugar schemes, etc. A large number of technical enquiries were also attended to by correspondence.

I. Number advised regarding sites, etc.	129
(*i*) Specifications and schemes	41
(*ii*) Tenders scrutinised	11
(*iii*) Technical advice dealing with erection and starting up	77
II. No. of factories advised during operation regarding efficiency of working, etc.	27
III. No. of replies regarding technical education in India and abroad	87
IV. No. of replies to general technical enquiries (excluding above)	259
V. No. of sugar factories helped in recruiting their technical staff	36

Production figures for 1932-33 for factories making sugar direct from cane and for refineries were obtained and consolidated statements of sugar production were compiled and published in the 'Indian Trade Journal' and 'Agriculture and Live-Stock in India'. The production of sugar direct from cane in India in the cane crushing season 1932-33, amounted to 290,177 tons as against 158,581 tons during the previous season. The total quantity of sugar refined from gur in 1933 was 80,106 tons compared with 69,539 tons in the preceding year. Thus the total production of sugar in India for the combined cane and gur season amounted to 370,283 tons in 1932-33 as against 228,120 tons in 1931-32. The estimated

quantity of sugar produced by indigenous process during 1932-33 was 275,000 tons, as against 250,000 tons during the preceding season, making 645,283 tons as the total production of sugar in India from all sources during 1932-33 compared with 478,120 tons in 1931-32. Production of sugar from cane factories in India during 1933-34 season amounted to 453,465 tons. Figures of sugar production from refineries for 1934 are not yet available. It is estimated that the production of sugar by the indigenous process during 1933-34 will be 225,000 tons and the total production of sugar from all sources during 1933-34 may be estimated at 758,000 tons.

During the year under report separate sugar maps for India, United Provinces and Bihar and Orissa were prepared showing the location of sugar factories and area under sugarcane in each district. Arrangements for publication of these maps are now being made.

The following laboratory investigations were undertaken by the Sugar Section of the Harcourt Butler Technological Institute of which the Sugar Technologist is the honorary Head :—

(*a*) Preparation of Artificial Sajji composition;

(*b*) Treatment of Factory Effluents;

(*c*) For utilization of molasses :—

(i) Dehydration of alcohol,

(ii) Manufacture of Glacial Acetic Acid by Acetic Fermentation,

(iii) Road composition from molasses;

(*d*) Experiments on the keeping quality of gur are being continued.

(ii) *Statistical.*—The work in the statistical section of the Sugar Technologist's office comprises the collection and distribution of import and export statistics for Indian markets as well as for the principal sugar producing and consuming centres of the world, areas under sugarcane and beet in India and foreign countries and production and consumption of sugar in various countries of the world. A large number of enquiries were received from the public and Government officers asking for information in connection with these and all available information was supplied to them.

The office of the Sugar Technologist, as usual, continued to furnish the Department of Commercial Intelligence and Statistics, Calcutta, with brief reviews of the sugar crop conditions

in the world for incorporation in the all-India sugarcane crop forecasts published in August, October and February each year. A review of the Sugar Industry in India for 1932-33 was compiled and published as a supplement to the 'Indian Trade Journal'.

During the year under report the Sugar Cable Service including the Sugar Postal Service continued to obtain and distribute among its subscribers early and reliable reports of crop and market conditions of sugar in the principal sugar producing and consuming countries of the wrold. In view of the rapid development of the Indian Sugar Industry and in order to meet the increasing demand of those interested in the sugar trade of India, a need arose for a new service—the 'Indian Sugar Trade Information Service'. This service was actually started in the middle of March 1934; its main functions consist in collecting and collating daily and weekly Indian sugar market reports, statistics relating to sales and stocks and other important information pertaining to Indian factory made sugar from a number of important sugar markets of India, and in distributing the same among its subscribers and agents in India and abroad.

(iii) *Miscellaneous—*

(*a*) *Training in Sugar Technology.*—During the year 1933-34 ten students from other provinces were admitted to the Diploma course of the Harcourt Butler Technological Institute, Cawnpore, on behalf of the Imperial Council of Agricultural Research. Of the 10 students selected for admission, four came from Bihar and Orissa, two from the Punjab, two from Delhi and one each from Madras and an Indian State. All the students admitted in the previous year 1932-33 passed their final Diploma examination and all of them found employment in sugar factories.

(*b*) *Employment Bureau.*—The work in this branch was unusually heavy during the year. Many persons after gradually realizing the utility of the bureau, sent in their names for registration, and many of them were suitably provided for in different sugar factories. The sugar factories also now appreciate the benefit of the employment bureau and in many cases sent in requisitions for complete staff. The bureau selected and suggested trained hands as far as possible to suit their requirements.

(*c*) *Library*.—The Library, which contains books and periodicals relating to the sugar industry, was increasingly used during 1933-34 by those interested in the industry and by research workers. It was possible during the year to add to the library 141 important books and publications on sugar industry. In addition to this a complete set of 'Archief Voor de Suiker Industrie in Nederlandsch-Indie', a most valuable sugar journal published in Java, was also purchased for the library. This was a most useful addition to the library which is of great help to the general public as well as to the students and instructional staff of the sugar Department of the Harcourt Butler Technological Institute. The number of books sent out on loan was greater than in the previous year.

(*d*) *Publications*.—During the year 1933-34 thirteen notes giving statistical information were published in the 'Indian Trade Journal' and two notes in the 'Agriculture and Live-Stock in India'.

(*e*) *Museum*.—Samples of sugar produced in sugar factories in India were maintained as usual.

24. *Soil Science*—

(i) *Soil Science Committee*.—At its meeting held in August 1933, the Advisory Board recommended that a standing technical committee should be appointed for the examination of all schemes of soil research submitted to the Board and the annual progress reports on such schemes. Recent development in soil science has been rapid and there was special need for securing co-operation between research workers in soil science, for more uniformity in experimental methods and for co-ordination of research projects. The recommendation of the Board was accepted by the Governing Body and a Soil Science Committee has accordingly been set up, under Rule 30 of the Rules and Regulations of the Imperial Council of Agricultural Research. The personnel of the Committee will be found in Appendix IX.

The Committee met for the first time in conjunction with the meetings of the Advisory Board held in February 1934 and a statement is appended which shows the subjects discussed (Appendix X).

(ii) *Indian Society of Soil Science*.—The Council assisted in the formation of an Indian national section of the International Society of Soil Science, a proposal initiated by Dr. B. A. Keen while he was Director of the Imperial Institute of

Agricultural Research, Pusa. The Agricultural Expert to the Council arranged for the question to be discussed by a meeting of Soil Scientists during the Indian Science Congress session at Bombay in January 1934. The meeting recommended the formation of such a national section, which would be an essentially un-official organisation, and appointed an organising Committee, with the Agricultural Expert to the Council as its Provisional President, and Professor J. N. Mukherjee as Secretary, to draw up a scheme and draft bye-laws and to arrange for the formation of the Society. The Committee has since concluded its work and the Indian Society of Soil Science formed which will hold its first annual meeting in January 1935. The Society has as one of its principal objects the performing of the functions of the Indian national section of the International Society of Soil Science. The proposal received the support of the Soil Science Committee of the Council which assisted in the framing of the scheme.

(iii) *Third International Congress of Soil Science.*—The Imperial Council has received a special request from the President-elect of the Third International Congress of Soil Science, to be held in England in July 1935, that a strong and representative Indian delegation should be arranged and that, if possible, at least one official delegate should be sent. The various provincial agricultural departments and universities in India were accordingly addressed offering to arrange facilities for such of their soil workers as are likely to be in England at the time, to attend the Congress. There has been a good response to this invitation and a representative delegation is anticipated The Advisory Board have recommended that the Imperial Council should meet the expenses of one delegate from India who should be nominated by, and if possible be the President of the Indian Society of Soil Science.

25. *Statistical Section of the Imperial Council of Agricultural Research.*—The section consists of the Statistician, a trained statistical assistant, and a routine clerk.

(i) *Statistical assistance to agricultural departments in the various Provinces and States and to officers in charge of schemes financed by Imperial Council of Agricultural Research.*—The main functions of the Statistician are to assist agricultural officers in all Provinces and constituent States in the planning of new experiments with the object of ensuring the greatest accuracy possible; to help them in the statistical analyses of

their experimental results; and to give them all possible assistance in the statistical interpretation of the immense amount of useful data that have been accumulated in all parts of India and in all branches of agricultural research. The planning of field experiments on modern lines has received special attention. The services of the statistician to the Council were made use of by the following Institutes and Departments during the year under report. The Statistician was asked to visit the farms in most cases, and his visits were reported to have been helpful to the experimenters.

(1) The Imperial Institute of Agricultural Research, Pusa.

(2) The Indian Tea Association, Cinnamara, Assam.

(3) The Provincial Departments of Agriculture:—

1. Madras.
2. Bombay.
3. Bengal.
4. United Provinces.
5. Punjab.
6. Burma.
7. Bihar and Orissa.
8. Central Provinces.
9. Assam.

(4) The Departments of Agriculture of the Hyderabad and Baroda States.

(5) The officers-in-charge of Agricultural Research Schemes financed by the Imperial Council of Agricultural Research.

When research schemes financed by the Council involve field experiments, the statistician is invariably consulted by the officers-in-charge of these schemes, regarding the 'lay-out' to be adopted. The experimental results of agricultural schemes in progress are in all cases examined by the Statistician to ensure a correct interpretation of the results and the data sent in during the year were in many cases actually worked out by the section.

(ii) *Fertilisers' Committee.*—During the year under report, the statistical section finished the collation of the results of the manurial experiments carried out in the past,

in the several provinces, and at the Pusa Research Institute, Tocklai Tea Experimental Station and in Mysore. The report was considered by the Fertilisers' Committee of the Council, and on the basis of it recommendations have been made by the Committeé for the planning of new experiments in the various provinces and States. The statistician to the Council has been asked to assist provincial and state officers in the design of the proposed experiments.

(iii) *Statistical notes.*—In February 1934, the Advisory Board recommended:—(1) that statistical notes on topics connected with the 'lay-out' of field experiments and analyses of experimental results might be published by the Statistician for the benefit of agricultural workers in India; and (2) that the statistician might get into touch with statisticians in other countries on the subject. Accordingly the statistician circulated to the Directors of Agriculture of Provinces and States and to statisticians in India; (1) a list of topics on which he proposes to write notes, (2) a list of statistical tables which he proposes to compile, and (3) a standard form for the presentation of experimental results. The statistician's suggestions were accepted in the main and two articles have been published and well received.

(iv) *Articles intended for publication in the Council's journals.*—The Statistician in addition to acting as one of the referees for papers involving statistics has also assisted several authors in regard to the presentation and interpretation of their statistical data.

In addition to the statistical work connected with the administrative work of the Imperial Council of Agricultural Research Department the statistical section prepared the tabulated statistics and graphs required for the Crop Planning Conference and the Wheat Conference convened by the Government of India shortly after the year under report.

26. *Locusts*—

I. *Locust Movement.*—During the year under report, six different official reports of swarms were received by the Locust Bureau of the Council from different parts of the Punjab, Rajputana, United Provinces, Central India and Western India States Agency, besides which unofficial information in regard to the prevalence of a few swarms at about the same time in North-West India was also gathered by our locust

survey parties. In no case, however, were the reports verified by a collection of actual specimens and a determination of the species concerned. Some of the un-official reports proved to be false alarms, a swarm of dragon flies in one instance, and a flight of starlings in another, being mistaken for locusts. A study of the movements of the swarms as indicated in the official reports shows that they have taken directions very similar to those of the swarms of the autumn and winter months of 1929 and 1930 in Rajputana, Central and Western India. Since Locust survey parties working in Jaisalmer and Bikaner had reported an extensive multiplication of locusts in the wake of the heavy monsoon rainfall of 1933, the flights reported probably took place.

II. *Locust Surveys.*—Two new survey circles were opened with centres at *Mirpurkhas* in Sind and at *Khanpur* in Bahawalpur State, with two locust observation posts under each, located in the deserts of Sind and Rajputana. Two more observation posts were opened in Mekran at Gwadar and Turbat.

Extensive tours were undertaken through the desert tracts of Sind, Rajputana and Baluchistan and many of the areas not previously visited, were properly surveyed for the desert locust. As a result of these and previous surveys, the desert locust, far from having disappeared after its recent outbreak of 1926-31, has been found to be present, in its non-swarming or solitary phase, in small numbers in certain sandy areas known as *'reks'* covered with densely growing *Xerophilous* vegetation, and situated in the deserts along the Mekran Coast and in parts of the desert areas of Sind and Rajputana. From the continued presence of the locust in these areas, it is presumed that they may be functioning as 'reservation areas' for the solitary phase during the period of its 'minimum'.

III. *Ecological Studies.*—Ecological studies on the desert locust were continued, as in the previous year, at the Field Laboratory, Pasni, and also at another Field Station opened at Ambagh, in the Las Bela State, in June 1933. The salient features of the ecological work done so far, indicate the importance of climatic factors, particularly of rainfall, in the bionomics of the desert locust. Field observations made, previous to and during 1933, in Mekran, Sind and Rajputana, show that the breeding of the locust is intimately connected with the occurrence of rainfall. In the winter months of

1932-33, abundant rainfall occurred along the western part of the Mekran Coast, followed by fairly extensive breeding of the solitary phase of the locust. On the other hand, during the summer months of 1933, rains were received only on the eastern coastal region belonging to the Las Bela State and in certain portions of Sind and Rajputana, in the wake of which the locust produced a summer generation in these areas.

As to the number of generations in a year the data collected so far are insufficient for drawing any definite conclusions. Locust breeding has, however, been found more or less to depend on the occurrence of rainfall and since the seasonal distribution of rainfall is different in different geographical regions, the locust has been observed to produce either a spring or a summer generation, according as the particular region inhabited by the locust, comes under the influence of winter or summer rainfall. Detailed observations made on the Pasni-Gwadar reks, however, during 1933, indicated that the locust had produced two generations one after the other, in the wake of the heavy rains received there in February and April 1933.

Other aspects of the ecological work, such as the habits, behaviour and the general life-history of the locust are also being studied at the Pasni and Ambagh Field Laboratories.

IV. *Study of past records on the desert locust.*—A good deal of information has been collected by the study of the various official files on locusts belonging to the Administrations of Baluchistan, Sind, Rajputana and the Western India States. In regard to the recent locust outbreak of 1926-31, the data available are fairly full, but for the years prior to 1926 the information collected is, on the whole, fragmentary.

Of the data so far available, a detailed study is being made in regard to the periodic cycles of the locust outbreaks and their movements in the past in India and Baluchistan. From a cursory study of the same, however, the following tentative conclusions may be drawn:—

(*a*) The recent locust cycle of 1926-31 presumably had its origin in the 'rek' breeding grounds of the Mekran Coast, and similar areas outside Indian limits in the spring months of 1926, where an over-multiplication occurred closely in the wake of the wide-spread and heavy rains of January 1926.

(*b*) The huge swarms produced in Sind, Las Bela and Rajputana in the summer of 1926, spread westwards, north-wards and east-wards and were presumably responsible for the wide-spread infestation that occurred in the spring of 1927 in Baluchistan, Punjab and United Provinces.

(*c*) A study of the movements and activities of the locust during the years 1927-31 indicates that breeding occurred during the spring months chiefly in the countries subject to winter and spring rainfall such as Baluchistan and North-West Frontier Province, eggs being laid by the over-wintered swarms migrating there from the neighbouring areas. The resultant swarms of pink fliers were found usually to move east-wards from May to August, from Baluchistan into Sind, Punjab and Rajputana and to breed there during the monsoon months. The summer generation, thus produced, was, in its turn, found to migrate from September onwards either further east-wards into United Provinces, Central India and Bengal where the swarms would appear ultimately to die out, or return westwards into Sind and Baluchistan where after over-wintering, it would produce a spring generation (provided rainfall occurred).

(*d*) The study of the recent locust outbreak would thus indicate that the infestation was kept going from year to year during 1926-31, by a system of *circulatory movements* of the swarms directed in spring and summer eastwards towards summer rainfall areas and in autumn and winter, westwards into regions of winter rainfall. The break-down of the cycle in 1931, would appear to have been partly due to the absence of westward migration in 1930, followed by a shortage of monsoon rainfall in North-West India in general in 1931 and the failure of winter rains in 1932 in Baluchistan.

27. *Marketing of Agricultural Produce.*—(1) During the year under review the Council undertook an important extension of its activities, *viz.*, the improvement of marketing of agricultural produce in India. The reports of the Royal Commis-

sion on Agriculture in India and the Central Banking Enquiry Committee drew attention to the loss which occurs through ineffective marketing and put forward recommendations for improvement. The marketing of agricultural produce being largely a matter of provincial concern it was for Provincial Governments to consider what action, if any, they should take on the majority of the recommendations referred to but some of these are of all-India importance and application. The Central Banking Enquiry Committee stressed the necessity for some central agency to advise and assist in co-ordinating provincial activities, particularly in the case of agricultural produce intended for export, and to give assistance to provincial organisations by way of advice and research. It further recommended that this task should be undertaken by the Imperial Council of Agricultural Research.

(2) Although they had accepted in general the recommendations of the Royal Commission on Agriculture regarding market surveys and the appointment of expert marketing officers in the Provincial Agricultural Departments and in several instances had taken such action in that direction as their finances permitted, local Governments were in general deterred by financial stringency from making substantial progress. The Government of India, in view of the importance of improved agricultural marketing as an aid to the general economic recovery of the country, came to the conclusion that a stage had been reached where action might usefully be taken to study in detail the all-India aspects of the problem. Moreover it was decided that substantial expenditure would be justifiable, even at a time of financial stringency, if the position of Indian agricultural produce in world markets could be strengthened and the agriculturalist enabled to take greater advantage of the huge internal market for such produce.

(3) Accordingly, Provincial Governments were consulted in July 1933 and on receipt of their replies, the Government of India placed the matter before the Advisory Board of the Imperial Council of Agricultural Research for an expression of opinion. In the light of the replies received from local Governments the Board unanimously recommended action on the following lines :—

(*a*) The first step should be the appointment for a limited period of a highly qualified and experienced Marketing Expert, with practical

knowledge of the organisation of agricultural marketing in other countries of the Empire. This Officer and the necessary assistants should be on the staff of the Imperial Council of Agricultural Research and should undertake the investigation of marketing problems and formulate schemes for the improvement thereof, make recommendations as regards standard grades for the various commodities and advise local Governments and Provincial Departments of Agriculture generally in regard to agricultural marketing;

(*b*) Attention should be concentrated in the first instance on the principal commodities; and

(*c*) That local Governments should be invited to collaborate with the Marketing Expert, if appointed, by appointing provincial marketing officers.

(4) The Government of India accepted the view of the Advisory Board and decided that a Marketing Expert should be appointed on the staff of the Imperial Council of Agricultural Research for a period of three years and for this purpose undertook to place at the disposal of the Council a grant of one lakh per annum for a period of three years in the first instance. The Governing Body of the Council sanctioned the appointment of such an officer, and Mr. A. M. Livingstone, a senior official of the Marketing Branch of the English Ministry of Agriculture was selected for the post. Mr. Livingstone joined his duties in April 1934. The important developments which have since taken place fall within the scope of the next report.

28. *Imperial Agricultural Bureaux.*—These bureaux continued to be of practical assistance to Indian research workers and agricultural officers generally and their services and publications were increasingly used. The loan of translations and expanded summaries of important scientific papers published in foreign journals, especially the less accessible ones, is increasingly appreciated.

An outstanding event was the visit to India of Dr. P. S. Hudson, Deputy Director, Imperial Bureau of Plant Genetics, Cambridge, in the cold weather of 1933-34. The Agricultural Expert to the Council as official correspondent to the Bureau

prepared a suitable itinerary which included most of the important agricultural research institutes and stations. Dr. Hudson attended the Indian Science Congress at Bombay where, at a joint meeting of the Agricultural and Botanical sections he opened a symposium on 'Some recent work on plant genetics'. He was also invited to attend the meetings of the Advisory Board of the Imperial Council of Agricultural Research held at New Delhi in February 1934 and rendered great assistance as a member of the Committee which examined various provincial schemes of potato research as he gave, to the Committee and Board, an illuminating account of recent research on the potato in Russia and on the results of recent expeditions to South America. As a result the Committee decided to formulate an entirely new scheme of potato research for northern India. At the Board's meetings Dr. Hudson got into touch with many agricultural and animal husbandry workers in India. The visit further enabled research workers in India to appreciate the facilities provided by the Imperial Agricultural Bureaux. The importance and usefulness of periodical visits of this nature can hardly be exaggerated.

29. *World's Grain Exhibition and Conference, 1933.*—As was stated in paragraph 23 of the previous report, the Imperial Council of Agricultural Research arranged for the collection and despatch of suitable exhibits to the World's Grain Exhibition and also forwarded several papers for the conference which was held in conjunction with the Exhibition. Mr. B. D. Asli, the Indian Trade Publicity Officer under the High Commissioner for India, London, was deputed to attend the Exhibition and to direct the staging of the Indian exhibits thereat. Mr. Asli's report which has since been received proves beyond doubt the wisdom of India's participation in the Exhibition and Conference. To quote Mr. Asli's own words "The objects aimed at were propagandist and educational and not directly commercial and these objects were fully achieved. The Indian participation was a great success from an educational point of view. Numerous comments were heard from the general public and from technical and commercial men alike that they did not know that India was such a productive country, that India produced such fine wheat, as good in fact as the Canadian wheat, that India could grow rice and tea, cotton and jute, etc., in such colossal quantities and of such fine qualities, that they did not know that India had

large irrigation works, etc., India's vast resources were unknown to them. Their ignorance of real India was amazing and the Indian booth, without exaggeration, proved to be a great advertiser of the country's resources and culture at such a comparatively small cost. The trial has been lit and it remains to be followed up with energy.

Though no actual trade results were expected four good enquiries for rice were received".

As the Managing Director of the Exhibition and Conference stated "the variety of materials exhibited, which are not procurable in Canada, could not but impress our people with the many products which your country could supply us".

30. *Participation of India in International and Imperial Congresses and Conferences.*—In response to an invitation extended to India to participate in the Third Imperial Mycological Conference to be held in September 1934 the Council invited two mycologists who were to be in England at the time, *viz.*, Dr. W. McRae, C.I.E., I.A.S., recently Imperial Mycologist and Director, Imperial Institute of Agricultural Research, Pusa, and Dr. H. C. Chaudhuri, Reader in Botany of the Punjab University, to represent India at the Conference.

The Advisory Board recommended at its meeting held in February 1934 that India should participate in the Xth World's Dairy Congress to be held in Rome—Milan during April—May 1934 and in the Annual Congress of the Royal Institute of Public Health, Norwich, May 1934.

31. *Publications.*—The Council continued the publication of its three Journals, 'Agriculture and Livestock in India', the 'Indian Journal of Agricultural Science' and the 'Indian Journal of Veterinary Science and Animal Husbandry', the first two being issued bi-monthly and last quarterly. The number of original articles published in 'Agriculture and Livestock in India" was thirty-nine of which twenty-five related to soils and crops and fourteen to animal husbandry matters. Of the eightyone original cotributions published in the 'Indian Journal of Agricultural Science', forty-two may be classed as botanical, ten as chemical, nine as entomological, twelve as mycological and three as bacteriological. In the Indian Journal of Veterinary Science and Animal Husbandry twentyfive original contributions were published, of which

twentyone related to diseases of livestock, two to animal breeding and nutrition, and two deal with dairying. The size of the editions of these Journals was the same as last year, *viz.*, 1250 950 and 900 respectively. The average number of copies of each issue sold to subscribers and to casual purchasers was 225, 158 and 100 respectively. By far the largest number of copies fell under the Council's reciprocal free distribution scheme to agricultural and veterinary Departments and others, whilst next in importance came the Council's Library exchanges.

The following Scientific Monographs were published during the year :—

No. 4.—Life-histories of Indian Microlepidoptera, Second Series : Cosmopterygidae to Neopsenstidae. By T. Bainbrigge Fletcher, R.N., F.L.S., F.E.S.

No. 7.—The Influence of Manures on the Wilt Disease of *Cajanus indicus* Spreng, and the Isolation of Types resistant to the Disease By W. McRae, M.A., D.Sc. (Edin.), F.L.S. and F. J. F. Shaw, D.Sc. (Lond.), A.R.C.S., F.L.S.

No. 8.—The Silk Industry of Japan with notes on observations in the United States, England, France and Italy. By C. C. Ghosh, B.A., F.C.S.

The undermentioned three monographs were in the press at the end of the year :—

No. 5.—The Bombay Grasses. By E. J. Blatter, S.J., Ph.D., F.L.S. and C. McCann, F.L.S.

No. 6.—Helminth Parasites of the Domesticated Animals in India. By G. D. Bhalerao.

No. 9 —Mechanical Cultivation in India : A History of the large-scale experiments carried out by the Burma-Shell Oil Storage and Distributing Company of India, Ltd. By C. P. G. Wade.

The necessity has been felt for some time past for a suitable medium for the publication of material of considerable professional or technical interest to agricultural and veterinary

officers and research workers in India which was being submitted to the Council for publication but which was hardly suitable for the abovementioned Journals and monographs. This need has now been met by a new series of publications entitled 'Miscellaneous Bulletins of the Imperial Council of Agricultural Research.'. These bulletins will be issued from time to time as suitable material is available. Four Bulletins were in the press at the end of the year.

The prompt and regular distribution of publications to all those who need them is an essential part of the publication work. In 1930, when the Council assumed responsibility for the issue of the agricultural and veterinary publications in India which had previously been issued by the Imperial Department of Agriculture, it came to notice that the supply of official publications to agricultural and veterinary officers under local Governments in India was far from satisfactory. As the result of the system which had grown up, under which the publications of one Department or Government could as a rule only be obtained on payment by other Departments and Governments, many officers were not receiving all the publications of other Governments which were needed for their work. In order to remedy this drawback, the Council in 1931 proposed to Local Governments a reciprocal arrangement under which each Government would exchange its agricultural and veterinary publications with the Council and with each other. The Government of India was also addressed regarding the publication of Minor Administration and the Imperial Institutes of Agricultural and Veterinary Research. It is extremely gratifying to be able to report that, after protracted correspondence, all the Governments in India including the Minor Administrations and the Imperial Institutes of Agricultural and Veterinary Research agreed to adopt the scheme which has been brought into force from June 1933. Under this arrangement, the Council supplies, in the aggregate, about 150 copies of each of its publications for the use of the agricultural and veterinary officers in the various parts of India, while every Government participating in the scheme, not only supplies the requisite number of copies of each of its publications to the Council, but also supplies an agreed number of publications free of charge to other provinces and administrations for the use of agricultural and veterinary officers and research workers. It is hoped that this arrangement will go far to meet the

criticism that, while substantial sums are being spent on research, inadequate attention was being given to making the results available throughout India. Much more remains to be done before the position can be considered satisfactory, and in particular the better abstracting of work published in India is needed, but a start has been made. It may now fairly be claimed that as a result of these efforts, and of the valuable assistance received from the Imperial Agricultural Bureaux, in regard to foreign literature, agricultural and veterinary officers and research workers in India are better able than formerly to keep in touch with recent advances in scientific knowledge.

The demand from the public for the free supply of the Council's publications continues to increase more rapidly than does the ability of the Department to meet it. In addition to about 180 institutions in India, which are on the free distribution list, about a hundred requests for stray copies from occasional applicants were received, this is in addition to a large number of copies supplied on request to members of the Central Legislature. In this matter, it is always somewhat difficult to strike a fair balance between two conflicting interests. On the one hand, financial considerations and the desire to reduce to a minimum the risk of waste would call for a very restricted issue of free copies of publications except to recognised institutions and as library exchanges. On the other, the dissemination of agricultural and veterinary information is of primary importance and as only a small percentage of the agricultural population can in any case be reached by our publications, undue parsimony is to be avoided. In consequence requests for free copies of publications are subjected to careful scrutiny but otherwise treated as generously as financial considerations permit. In some instances the free supply of 'separates' of individual papers in our journals, instead of the journal itself, has proved a convenient solution.

The Editorial Committee of the Council met in February 1933, when it reviewed the working of the Council's system of publications during the previous two years. The principal recommendations made by the Committee are shown in Appendix XI and included proposals for the publication in the 'Indian Journal of Veterinary Science and Animal Husbandry' of abstracts of selected articles from foreign journals and chosen as being of practical value to Indian field workers; also for the publication of special popular articles in 'Agriculture

and Livestock in India' on recent advances in knowledge in special branches of agricultural and veterinary science. The Committee has also made some practical proposals for increasing the subscription circulation of the Journals.

The publication work of the Council affords numerous opportunities for establishing contact with the non-official scientific public and these are fully utilized. By custom, a representative of one of the Indian Universities is invited to serve on the Editorial Committee, the appointment being annual. During the year under report Dr. Birbal Sahni, M.A., D.Sc., Sc.D., F.A.S.B., Professor of Botany in the Lucknow University, served on the Committee and the Council takes this opportunity of thanking the authorities of the Lucknow University for his services and of expressing their appreciation of Professor Sahni's help. The panel of honorary specialist referees, to assist the Editorial Committee in the examination of papers received for publication, includes both non-official scientists and specialists serving in the various departments. The number of gentlemen who voluntarily gave their services as referees during the year was 74, and the Council has once again to record its deep sense of appreciation of the valuable help rendered by them, often at a considerable sacrifice of their leisure, without which it would have been impossible to maintain the present standard of the journals.

32. *Library.—I. General.*—Since its foundation in 1930, when a beginning was made with a couple of hundred books, the Research Library of the Council has grown rapidly. At present it possesses about 12,000 volumes, besides a large number of pamphlets and bulletins, and is receiving over 200 scientific and technical periodicals from various parts of the world. This is satisfactory progress, but there is still great need for further extension of the Library before the library can be considered as at all representative. The annual provision of Rs. 5,000 for the purchase of new books and current periodicals is barely sufficient for immediate needs and, as stated last year, a special non-recurring appropriation for the library from the Council's funds was contemplated. Unfortunately, this has had to be postponed owing to the present financial stringency.

The exchange of publications has been successful and the number of books and publications received in this manner is steadily increasing. 1,805 books and 102 periodicals have

been received as exchanges during the year from the following countries :—

Name of Countries.	No. of volumes received.
1. Africa	69
2. Australia	67
3. Argentina	3
4. Brazil	3
5. Canada	115
6. China	7
7. Dutch East Indies	14
8. Great Britain	222
9. Holland	15
10. India—	
(*a*) Local Governments	377
(*b*) States and Private Societies	127
11. Italy	4
12. League of Nations	64
13. Malaya States	11
14. New Zealand	7
15. Russia	38
16. United States of America	651
17. West Indies	11
Total	1,805

II New Additions.—(*a*) Books : 1,822 books, excluding 995 pamphlets, small bulletins and leaflets have been added during the year under review. The total number of volumes in the Library on the 1st April 1934 was 11,259 as compared to 9,437 last year, and the Library possesses a collection of more than 6,000 pamphlets and bulletins mainly scientific reprints. Of the new additions 372 volumes were purchased, 501 were received in exchange, and the rest were presented. The Library continues to receive a generous free supply of publications from the United States Department of Agriculture and other American Institutions, and 651 bulletins and reports were received from that country during the year.

The following important sets of periodicals have been added to the Library during the year :—

1. Poultry Science Volumes 1—9.
2. Tropical Agriculturist Volumes 41—48.
3. Journal of the Bombay Natural History Society : 14 volumes.
4. Sydney University Reprints of papers on agricultural and allied sciences.
5. Journal of the Royal Statistical Society 1929 to date.

(*b*) *Periodicals.*—The number of current periodicals received regularly in the Library has increased to 226 as compared to 179 last year, chiefly by way of exchange and free supply. Only 84 of these journals are purchased.

A revised and up-to-date list of important periodicals is given at Appendix XII.

III. Cataloguing.—A card catalogue showing the author, subject and character of all the books and publications in the Library is maintained. This catalogue has approximately 40,000 cards, of which about 9,000 were typed during the year under report. The preparation of a printed catalogue of the Library books had been put in hand and copies will be distributed to important institutions as soon as ready.

IV Circulation.—Increasing use is being made of the Library, both by officials and non-officials, and special facilities are given for study and research work in the Library premises; 1,234 volumes were lent out of the Library while about 750 books were consulted in the Library reading room; 2,842 issues of current periodicals were circulated to officers and members of the staff of the Department. Arrangements have also been made for the supply of books on loan to agricultural and veterinary officers of the Provincial Departments and other research workers in the various provinces. During the current year 51 books were so issued.

33. *Meeting of Members of the Indian Legislature to discuss the work of the Council.*—It was stated in the last year's report that at the desire of the members of the Central Legislature who attended the meeting held in March 1933, the Vice-Chairman undertook to place before the authorities the question of making such meetings an annual institution. It has since been decided to hold such a meeting every year, and the second took place on the 10th April 1934, shortly after the close of the year under report.

34. A statement of audited accounts of the Council for 1933-34 and a list of schemes sanctioned that year are given in Appendices XIII and XIV respectively.

35. A list (Appendix XV) of scientific and technical officers paid from the research grants of the Imperial Council of Agricultural Research as on 31st August 1934 is also appended.

CHARAN DAS,
Secretary.

APPENDIX I (*cf.* page 6).

Names of members of the three Standing Animal Husbandry Committees.

Animal Nutrition.

1. Vice-Chairman, Imperial Council of Agricultural Research, *Chairman.*
2. Animal Husbandry Expert, Imperial Council of Agricultural Research.
3. Mr. F. J. Warth, Physiological Chemist, Imperial Department of Agriculture.
4. Dr. P. E. Lander, Agricultural Chemist to Government, Punjab.
5. Dr. K. C. Sen, Bio-Chemist, Imperial Institute of Veterinary Research, Muktesar.
6. Rao Bahadur B. Viswanath, Imperial Agricultural Chemist, Imperial Institute of Agricultural Research, Pusa.
7. Secretary, Imperial Council of Agricultural Research, *Secretary.*

Cattle Breeding.

1. Vice-Chairman, Imperial Council of Agricultural Research, *Chairman.*
2. Animal Husbandry Expert, Imperial Council of Agricultural Research.
3. Mr. T. F. Quirke, Director of Veterinary Services, Punjab.
4. Captain C. E. MacGuckin, Assistant Director, Military Dairy Farms, Lahore Cantonment.
5. Mr. E. J. Bruen, Livestock Expert to Government, Bombay.
6. Ch. Dost Mohd. Khan, Proprietor, Jehangirabad Cattle Farm.

Dairying.

1. Vice-Chairman, Imperial Council of Agricultural Research. *Chairman.*
2. Animal Husbandry Expert, Imperial Council of Agricultural Research.
3. Col. G. F. Meller, Director of Farms, Army Headquarters.
4. Mr. Z. R. Kothawala, Imperial Dairy Expert.
5. Mr. F. J. Gossip, Livestock Expert to Government, Bengal.
6. Sardar Datar Singh, Proprietor, Montgomery Dairy Farm.

APPENDIX II (*cf.* page 16).

Recommendations of the Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry as approved by the Advisory Board of the Imperial Council of Agricultural Research on the question of undertaking a systematic survey of the livestock wealth of the country and the classification under which the quinquennial census of cattle in India should be taken.

* * * * *

(1) That the standard classification agreed on by the Committee should be circulated and Provinces and States should be asked if they would be willing to co-operate in carrying out a simultaneous census on this basis.
(2) That the census should be taken during the first week of January.
(3) That a census interval of 5 years would be the most suitable.
(4) That the classification shown on page 2 of Mr. Kothavala's note to the Animal Husbandry Wing Meeting should be accepted as modified by the Committee. A copy of the modified classification is attached for information.
(5) That rail-borne and river-borne trade returns should be revived for stock and for animal products.
(6) That the quinquennial census should be carried out by the Revenue Department (Land Record Staff).
(7) That a general statistical analysis of the figures should, if possible, be carried out by the Statistician, Imperial Council of Agricultural Research.

It was also recommended:—

(*a*) That with a view to obtaining uniformity model instructions for taking the census should be issued if Provinces and States agree to co-operate.
(*b*) That Provinces and States should be asked to furnish the Imperial Council of Agricultural Research with copies of their mortality statistics annually, as soon as completed.

Modified classification for the cattle census.

- CATTLE
  - OXEN
    - MALES
      - (*i*) Bulls (entire males) over 3 years—
        - (*a*) For stud purposes.
        - (*b*) For work purposes.
      - (*ii*) Bullocks (castrated males) over 3 years.
      - (*iii*) Bulls and bullocks over 3 years not used for work or breeding.
      - (*iv*) Young stock (male) 1 to 3 years.
      - (*v*) Calves under 1 year.
    - FEMALES
      - (*i*) Cows (over 3 years) used for milk production or breeding.
      - (*ii*) Cows not used for milk production or breeding.
      - (*iii*) Young stock (female) 1—3 years.
      - (*iv*) Calves under 1 year.
  - BUFFALOES
    - MALES
      - (*i*) Stud bulls over 3 years.
      - (*ii*) Work animals over 3 years.
      - (*iii*) Males not used for work or stud.
      - (*iv*) Young stock 1 to 3 years.
      - (*v*) Calves under 1 year.
    - FEMALES
      - (*i*) Adults used for milk production or breeding.
      - (*ii*) Adults not used for milk production or breeding.
      - (*iii*) Young stock 1 to 3 years.
      - (*iv*) Calves under 1 year.

N.B.—Any females over 4 years of age which have not calved should be classed as not used for breeding.

APPENDIX III (*cf.* page 17).

Statement showing the Research Schemes in progress during the year 1933-34

Serial No.	Name of Scheme.	Sanctioned grant. Rs. a. p.
	A.—Sugar Schemes.	
1	Sugar Committee	40,600 0 0
2	Sugar Technologist—	
	(*a*) Main Office	1,66,100 0 0
	(*b*) Sugar Cable Service	40,900 0 0
	(*c*) Indian Sugar Trade Information Service	34,100 0 0
3	Lump sum grants of Rs. 8,000 each to United Provinces, Bihar and Orissa and Punjab Government for experiments in designing of a satisfactory small power sugarcane crushing mill. A further grant of Rs. 5,000 was sanctioned for the Punjab.	29,000 0 0 (24,000 *plus* Rs. 5,000 extra grant to the Punjab).
4	Bombay-Deccan Sugarcane Research Scheme	5,22,000 0 0 (from 1931-32 to 1935-36).
5	Grant to Harcourt Butler Technological Institute, Cawnpore.	2,25,000 0 0 (from 1930-31 to 1934-35).
6	Scheme for the establishment of a Sugarcane Research Station in Bihar and Orissa and for the appointment of a Sugarcane Specialist.	1,92,800 0 0 (from 1931-32 to 1936-37).
7	Scheme for the establishment of a Sub-Station of the Coimbatore Imperial Sugarcane Station at Karnal.	82,000 0 0 (from 1931-32 to 1935-36).
8	Scheme submitted by the Imperial Mycologist, Pusa, for research on "Mosaic" and other Cane diseases at Pusa.	65,000 0 0 (from 1932-33 to 1934-35).
9	Bengal Scheme for Sugarcane Crushing and Gur Boiling.	5,700 0 0 (from 1930-31 to 1934-35).
10	Sugarcane Seedling Testing Station at Dacca	13,100 0 0 (from 1931-32 to 1935-36).
11	Economic Enquiry into the cost of production of crops in the principal Sugarcane and cotton tracts in India.	4,43,200 0 0 (from 1932-33 to 1935-36).
12	Chief Economist and his staff	68,800 0 0 (from 1932-33 to 1935-36).
13	Research on Sugarcane in the Madras Presidency	1,50,100 0 0 (5 years).
14	Establishment of a Sugarcane research station in the Punjab.	1,33,000 0 0 (from 1933-34 to 1938-39).

Serial No.	Name of Scheme.	Sanctioned grant. Rs. a. p.
	A—Sugar Schemes - Contd.	
15	Investigation into various problems of sugar industry in the United Provinces.	1,01,300 0 0 (from 1933-34 to 1938-39).
16	Establishment of a Research and Testing Station for the indigenous system of gur and sugar manufacture by the Sugar Technologist to the Council.	1,67,400 0 0 (5 years).
17	Extension of Sugarcane work at the Jorhat Experimental Station, Assam.	48,000 0 0
18	Investigation into the production of Khandsari sugar in United Provinces and Bihar and Orissa.	9,000 0 0
	B.—Agriculture Schemes.	
19	Grant to Dr. K. C. Mehta for investigation of rusts of wheat and barley.	41,432 13 10 (from 1929-30 to 1932-33).
20	Botanical Sub-Station at Karnal . . .	1,33,900 0 0 (from 1930-31 to 1934-35).
21	Grant to Dacca University	39,800 0 0 (from 1930-31 to 1935-36).
22	Fertilizer's Committee	3,300 0 0
23	Professor Mukherjee's Scheme of research into properties of Colloid Soil Constituents.	14,100 0 0 (from 1931-32 to 1935-36).
24	Professor Mahalanobis' Scheme :—	
	(1) Investigation on experimental errors in field trials.	51,500 0 0
	(2) Statistical studies relating to Agricultural work in India.	
25	Grant to Principal, Agra College, Agra, for investigation into the rusts of wheat and barley.	54,600 0 0
26	Dr. Bhatnagar's scheme—	
	(*a*) 'Effects of Ions on Plant Growth'	8,000 0 0 (from 1930-31 to 1934-35).
	(*b*) 'Physico-chemical properties and fertility of soil'	10,700 0 0 (from 1931-32 to 1934-35).
27	Professor Dastur's scheme 'Rice-Physiology' .	10,800 0 0 (from 1931-32 to 1933-34).
28	Dr. Chaudhri's scheme 'Wither-tip of Citrus trees'.	13,800 0 0 (from 1931-32 to 1934-35).

Serial No.	Name of Scheme.	Sanctioned grant. Rs. a. p.
	B.—Agriculture Schemes—Contd.	
29	Establishment of a new branch of Agricultural Meteorology under the Indian Meteorological Department, Poona.	61,600 0 0 (from 1932-33 to 1935-36).
30	Appointment of a Physical Assistant on the staff of Agricultural Chemist, Bengal.	22,600 0 0 (from 1931-32 to 1935-36).
31	Co-ordinated scheme of Rice Research in Provinces	10,96,400 0 0 (from 1931-32 to 1935-36).
32	Award of a prize for a bone crusher worked by—	
	(*a*) Animal power	7,000 0 0
	(*b*) Mechanical power	
33	Exhibits for World's Grain Exhibition and Conference.	11,500 0 0
34	Special Locust Research staff	3,60,200 0 0 (from 1930-31 to 1934-35).
35	Grant to Punjab Government for Locust Research.	12,000 0 0
36	Locust Committee	5,900 0 0
37	Locust Bureau	38,200 0 0
38	Experimental consignment of mangoes to the Empire Marketing Board.	9,544 13 9
39	Research work on potatoes in Madras . . .	20,000 0 0 (from 1933-34 to 1937-38).
40	Oil Seed Crushing Industry Committee . .	18,200 0 0
41	Grant to the Burma Shell Oil Storage and Distributing Company, Bombay.	7,000 0 0

APPENDIX IV (*cf.* page 55)

Summary of recommendations of the Indian Oil Crushing Industry Committee Third Meeting, April 1933.

Item No.	Subject.	Recommendation of the Committee.
1	Application from the Annamalai University for a grant of Rs. 2,000 to investigate the problem of marketing the groundnut crop in the South Arcot District.	It was decided that the re-consideration of this scheme should wait till the proposed Central Oil-seeds Committee was established (*vide* item No. 21).
2	Shelling machines for groundnuts.	It was decided that wetting of groundnuts before shelling should be discouraged, and that this should be borne in mind in connection with the improvement of hand shellers.
3	Standards of quality for oil-cakes.	The British Standards for oil-cakes should be published in the 'Agriculture and Live-stock in India'; copies should also be printed in the form of circulars, for circulation to oil millers through the provincial Departments of Industries.
4	Proposal to levy an export duty on certain oil-seeds and oil-cakes as a means of encouraging the Indian Oil Crushing Industry.	It was decided that the question of levying an export duty need not be pursued (*vide* also item No. 14).
5	Provision of adequate handling equipment at railway stations to prevent breakages of oil machinery in transit.	No action was considered necessary. If members would bring any specific instances to the notice of the Imperial Council, the matter would be taken up by the Secretariat of the Council with the Railway Department.
6	(*a*) Cultivation of tung .	(*a*) Attention was drawn to the variety trials conducted in India and the feeding trials conducted on tung seed meal at the Rowett Research Institute.
	(*b*) Tung Oil . . .	(*b*) The need for introducing the best varieties was emphasized and reference was made to the arrangements made by the Agricultural and Horticultural Society of India, Calcutta for the distribution of American tung seed in India.
7	Institution of courses to train mistries for the charge of oil crushing machinery.	It was agreed to be preferable that training should be given at existing institutes and that two centres one for the Northern Provinces and one for South India would be necessary.

Item No.	Subject.	Recommendation of the Committee.
8	(*a*) Proposed annual contribution by the Imperial Council of Agricultural Research to the Harcourt Butler Technological Institute, Cawnpore, towards the training of students in oil technology.	(*a*) This subject was postponed for discussion along with the U. P. Government's proposal for the conversion of the Oil Deptt. of the Harcourt Butler Technological Institute, Cawnpore, as an All-India Institute for Oil Technology under the Imperial Council of Agricultural Research.
	(*b*) Proposed conversion of the Oil Deptt. of the Harcourt Butler Technological Institute, Cawnpore, into an all-India Institute under the administration of the Imperial Council of Agricultural Research.	(*b*) The Committee recommended that the proposal should be examined by a small Sub-Committee consisting of the Chairman, the Agricultural Expert, Lala Maha Narain, and Mr. Athawale (with the Secretary of the Council as Secretary *ex officio*), the Director of Industries, U. P. being asked to be present as a visitor. The report of the Sub-Committee should be circulated to the Committee for their views. It was decided that the proposal regarding an annual contribution to the Harcourt Butler Technological Institute, Cawnpore, towards the training of students in oil technology, should await a decision on this subject.
9	Increasing the demand for oil-cakes.	Attention was drawn to the presence of traces of castor-seed in oil-cake exported to the United Kingdom and to the castor clause which existed in the United Kingdom contracts. It was decided that a note emphasizing the importance of avoiding traces of castor-seed in oil-cake should be circulated to all concerned, along with the proposed pamphlet regarding standards for oil cakes (*vide* item No. 3); they should be asked to report to the Council any case of special difficulty.
10	(*a*) Encouraging the cotton-seed oil industry in India.	(*a*) It was agreed that the crux of the matter lay in the possibility of establishing a regular demand for cotton-seed cake as a cattle-feed and that organised propaganda within reach of a regular supply of cake was needed. It was decided to invite the U. P. and Punjab Governments to submit definite proposals.

Item No.	Subject.	Recommendation of the Committee.
10—*contd.*	(*b*) Investigating into the most economic means of utilising cotton-seed :— De-linting and/or defibrating Feeding trials on cotton-seed *versus* cotton-seed cake.	(*b*) It was decided that trials both of delinting gins and defibrating machinery was needed in the Punjab and Madras on Punjab-American and Cambodia cotton respectively and that the matter should be followed up. Mr. Roberts offered special facilities at Khanewal. (A grant has been made for the purpose by the Indian Central Cotton Committee.)
11	The question of fiscal protection for :— (*i*) finished products such as soaps, paints and varnishes ; (*ii*) Semi-manufactured products, *e.g.*, 'boiled oil', 'stand oil', "lithographic varnish" ; (*iii*) Hydrogenated and raw oils ; (*iv*) Copra and similar agricultural products.	(*a*) *Soaps.*—Attention was drawn to the low fatty oil contents in several of the imported varieties of soap and to the need for laying down standards for soaps, both indigenous and imported, by legislation. It was decided that local Governments and the Departments of Industries and Labour should be consulted as to (*i*) the feasibility of fixing standards for soaps and (*ii*) the proposal that all soaps should be stamped with a guarantee of fatty acid content, before any question of legislating on standards for imported and indigenous soaps was considered. (*b*) *Importation of oils and vegetable products.*—Attention was drawn to the fact that fish oil was being imported, labelled as 'edible hardened oil', and used for adulterating ghee. It was decided that a member should put up a full statement of the case which would be referred to the factories in India interested in the manufacture of vegetable products.
12	Enquiry into the supply of coconut products and coconut oil in India.	The detailed scheme was approved.
13	Linseed—steps to be taken to develop the advantages arising out of the Ottawa preference.	(*a*) It was suggested that experimental work on the improvement of a seed and fibre strain of linseed might be worthwhile in the Punjab. (*b*) Reference was made to the alleged unfavourable treatment meted out to Indian linseed by the Inc. Oil-Seeds Assocn., United Kingdom, which accepted a F. A. Q. contract in the case of Argentine linseed but demanded a "sound delivery contract" for the Indian variety. It was decided that information regarding the contract should be obtained from the I. T. C., London. It was also noted that Indian linseed sells at a premium in Argentine.

Item No.	Subject.	Recommendation of the Committee.
13—*contd.*		(*c*) It was decided that the attention of the provincial Directors of Agriculture should be drawn to the fact that the Imperial Economic Botanist had ninety pure strains and hybrids of linseed, many with satisfactory commercial characters, covering a wide range of agricultural characters.
14	Steps which should be taken in order that the maximum benefit may be derived from the tariff preference on Indian vegetable oils obtained as a result of the Ottawa Trade Agreement.	(*i*) Oil millers in India should be educated as to the qualities required in the United Kingdom market and it was accordingly decided that a pamphlet detailing the standards for oils, oil-seeds and oil-cakes should be circulated (*vide* also item No. 3). (*ii*) It was agreed that the Indian oil crushing industry could not depend on the export of *both* oil and oil-cake. (*iii*) It was also agreed that the lack of a regular and profitable outlet for oil-cake frequently limited the development of the oil crushing industry in India and that an export duty on cake would therefore have a disastrous effect. The development of the dairy industry was needed to afford a profitable outlet for cake.
15	(*a*) Improving oil-seed crops and oil-bearing trees as regards yield and quality of crops, etc. (*b*) Improve storage of oil-seeds. (*c*) Cultivation of mahua and the introduction of new varieties of oil-seeds.	(*a*) It was stated that due to wetting, Pollachi groundnuts were marketed in an unsatisfactory condition in Bombay, thereby resulting in allowances as high as 25 p. c. having had to be made in the prices. The Committee decided that the attention of the Madras Government should be drawn to this. (*b*) It was decided that a general recommendation should be made to the Government of the Punjab that the possibility of growing a greater variety of oil-seeds in the Punjab should be explored.
16	Statistics of world castor-seed production.	The figures collected by the Council showed that India has no monopoly of this seed and it was therefore decided that the question of the levy of an export duty on castor-seed should not be pursued. It was also decided that the Indian Trade Commissioner, London, should be asked to keep the Council posted with latest information regarding the world castor-seed production, etc., from time to time.

tem No.	Subject.	Recommendation of the Committee.
17	Scheme for research work on oil-seeds in the Madras Presidency.	It was decided to omit castor and sesamum from the scheme and to confine it to groundnuts. It was also decided to omit items (8) and (9) from the programme. The Committee also agreed upon certain reductions in the staff, etc., for the scheme, which was then recommended for sanction.
18	Suggested programme of research work on oil-seeds.	The research work that had already been done on oil-seeds was referred to. It was suggested that Provincial Agricultural Departments should take advantage of the valuable collection of pure strains of linseed, sesamum and safflower available at the Pusa Research Institute. As regards coconut, it was decided that the report of the special enquiry proposed to be undertaken by the Council should be awaited. It was decided that the consideration of the scheme of the Industrial Chemist, Bengal, for research on the less known oil-seeds should be held over till the views of the Bengal Provincial Research Committee and of the Bengal Government thereon, had been received.
19	Simple methods of refining vegetable oils.	It was explained how, by a series of experiments, a simple method of refining vegetable oils had been evolved by the Madras Government. It was decided that the Council should obtain 100 copies of the Madras Government pamphlet on the subject which should be sent to various leading vernacular papers and periodicals through the Director of Public Information. The substance of the pamphlet would thus reach all who are interested in the subject.
20	(*a*) Organisation and development of the manufacture of soaps, and candles including standards of quality for soaps ; (*b*) Organisation and development of the manufacture of edible oil products including the question of standards and of description ;	The notes on the subject were recorded. Parts (*a*) and (*b*) had already been discussed under other subjects and parts (*c*) and (*d*) would be taken up at the next meeting of the Committee.

Item No.	Subject.	Recommendation of the Committee.
	(c) Organisation and development of the manufacture of lubricants ;	
	(d) Other steps to be taken to increase the demand for vegetable oils ;	
21	Proposal for (a) the establishment of a Bureau of Information and Statistics and the appointment of a Central Committee for oil-seeds and (b) for a cess on oil-seeds.	The committee re-affirmed its previous recommendations regarding the appointment of a permanent Central Committee for oil-seeds with a Technical Secretary, as recommended by the Advisory Board. It was also recommended that a cess of 4 annas per ton should be levied on all oil-seeds exported.

APPENDIX V (*cf*, page 56).

Distribution list for linseed circulars as on 3rd December 1934.

The Secretary to the Government of the United Provinces, Industries and Education Department, Allahabad.

The Secretary to the Government of the Central Provinces, Agriculture Department, Nagpur.

The Secretary to the Government of Bombay, Revenue Department, Bombay.

The Secretary to the Government of Bengal, Agriculture and Industries Department, Calcutta.

The Secretary to the Government of the Punjab, Development Department, Lahore.

The Secretary to the Government of Bihar and Orissa, Education and Development Department, Patna.

The Director of Agriculture, United Provinces, Lucknow.

The Director of Agriculture, Central Provinces, Nagpur.

The Director of Agriculture, Bombay Presidency, Poona.

The Chief Agricultural Officer, Sind, Karachi.

The Director of Agriculture, Bengal, P. O. Ramna, Dacca

The Director of Agriculture, Bihar and Orissa, Patna.

The Bihar and Orissa Chamber of Commerce, Patna.

The Bihar and Orissa Muslim Chamber of Commerce, Patna.

The Orissa Chamber of Commerce, Cuttack.

The Director of Information, Secretariat, Fort, Bombay.

The Director of Industries, Old Custom House, Bombay.

The Secretary, Bengal Chamber of Commerce, (Royal Exchange), Calcutta.

The Secretary, Bengal National Chamber of Commerce, 20, Strand Road, Calcutta.

The Secretary, Indian Chamber of Commerce, 135, Canning Street, Calcutta.

The Secretary, Marwari Chamber of Commerce, 203-1, Harrison Road, Calcutta.

The Secretary, The Muslim Chamber of Commerce, 22, Canning Street, Calcutta

The Secretary, Narayanganj Chamber of Commerce, Narayanganj (Dacca).

The Secretary, Chittagong Chamber of Commerce, Chittagong.

The Secretary, Calcutta Trades Association, 34, Dalhousie Square, Calcutta.

The Secretary, Indian Merchants Association, Chittagong.

The Secretary, Marwari Association, 134-B, Machuabazar Street, Calcutta.

The Secretary, Bengal Mahajan Sabha, 9, Baistab Charan Set Street, Calcutta.

The Secretary, H. E. H. the Nizam's Government, Commerce and Industries Department, Hyderabad, Deccan.

The Hon'ble the Agent to the Governor General, Rajputana, Mount Abu.

The Hon'ble the Agent to the Governor General in the States of Western India, Rajkot.

The Agent to the Governor General for the Deccan States and Resident at Kolhapur.

The Director of Agriculture, His Exalted Highness the Nizam's Government, Hyderabad (Deccan).

The Foreign and Political Department.

The Secretary, Indian Merchants' Chamber, 31, Marzban Road, Fort, Bombay.

The Secretary, Chamber of Commerce, Bombay.

The Secretary, Chamber of Commerce, Karachi.

The Secretary, Federation of Indian Chamber of Commerce and Industries, Pankoresmaka, Ahmedabad.

The Secretary, Marwari Chamber of Commerce, 248/3, Kalbadevi Road, Bombay.

The Secretary, Seed Traders' Association, Gaya Buildings, Musjid Bunder Road, Mandvi, Bombay.

The Secretary, Grain Merchants' Association, 262, Musjid Bunder Road, Mandvi, Bombay.

The Secretary, Deccan Merchants' Association, Bombay.

The Secretary, Karachi Indian Merchants' Association, Karachi.

The Secretary, Buyers' and Shippers' Chamber, Karachi.

The Secretary, Karnatak Chamber of Commerce, Bagalkot.

The Secretary, Maharashtra Chamber of Commerce, Phoenix Building, Graham Road, Ballard Estate, Bombay.

The Commerce Department.

The Director General of Commercial Intelligence and Statistics, New Delhi.

The Director of Industries, United Provinces.

The Collector, Jhansi.

The Collector, Jalaun.

The Collector, Hamirpur (United Provinces).

The Collector, Banda.

The Collector, Gorakhpur.

The Collector, Basti (United Provinces).

The Collector, Azamgarh.

The Secretary, United Provinces Chamber of Commerce, Cawnpore.

The Merchants Chamber, United Provinces. Cawnpore.

The Director General of Commercial Intelligence and Statistics, Calcutta.

The Honorary Secretary, The Southern Indian Chamber of Commerce, Indian Chamber Buildings, Madras.

The Manager, Messrs. Shree Bihariji Mills, Rice, Floor, Oil, Dall Mills, Foundary, Patna Ghat, P. O., Patna City.

Rai Bhowani Singh Bhandari, M.A., Provincial Durbar, Batala, Punjab.

The Secretary, Grain, Oilseed and Rice Association, Calcutta.

APPENDIX VI (*cf* page 58).

Statement showing the recommendations contained in the proceedings of the Second Meeting of the Fertilisers Committee.

Serial No.	Item No. of the Agenda.	Subject.	Recommendation of the Committee.	Action taken.
1	1	Decisions of the Governing Body on the recommendations of the Fertilisers Committee, First Meeting.	Noted	No action required.
2	2	Collection of data of manurial experiments conducted in the past.	(A) *Programme of manurial experiments, on uniform lines, for future.* It was agreed that the financial aspect of manuring was largely local and that a well planned series of manurial experiments would give information of permanent value from which the probable profit of manuring with any given combination of prices for fertiliser and crop could be worked out. As regards the technical lay-out for the future programme of experiments, it was agreed that (*i*) randomised experiments should be carried out and (*ii*) a special scheme of research to determine the best methods of lay-out should be conducted by the Statistician to the Council in co-operation with Agricultural Officers at those farms which had sufficient land and facilities for the purpose.	The Statistician is in communication with the Agricultural Officers concerned.
3	,,	Ditto .	(B) *Number of replications to be adopted in future experiments.* It was decided that the Committee should recommend seven as the minimum number of replications for all fertiliser experiments in the general scheme to be put forward.	The attention of all Departments will be invited to this recommendation.

4	,,	Ditto	(C) *Most suitable size and shape for experimental plots.*	
			It was decided that with the advice of the Statistician to the Council experiments should be conducted wherever possible to determine the ideal size of plot for different crops under different conditions. The question of the shape of the plot also should be decided by each experimenter in consultation with the Statistician to the Council.	The Statistician is in communication with Agricultural Officers.
5	,,	Ditto	(D) *Analyses of the soil of experimental plots.*	
			(*i*) *Chemical Analyses.*—It was decided that the minimum requirements would be the determination of (*a*) Total phosphates, (*b*) Available phosphates (by an agreed common method), (*c*) Total potash, (*d*) Available potash (by an agreed common method); (*e*) Lime, (*f*) Hydrogen in concentration (by an agreed common method) and (*g*) Organic matter by an agreed method. As regards methods of analysis it was decided that the Agricultural Chemists of all the Provinces should meet and discuss the methods to be adopted.	The attention of Agricultural Departments will be drawn to this recommendation.
			(*ii*) *Physical (Mechanical) Analysis.*—It was unanimously agreed that a mechanical analysis should be made for each block both by the "International" method (to secure complete dispersion) and after 12 hours shaking with water only. The first method would enable different soils to be compared, the second approximated more nearly to actual field conditions.	Ditto.
			(*iii*) *Biological Analyses.*—These would throw considerable light on fertility problems but as they could not be undertaken in any province except at a few special farms, it was left to Provincial Agricultural Chemists to consider what was possible in this direction.	No action required.

Serial No.	Item No. of the Agenda.	Subject.	Recommendation of the Committee.	Action taken.
6	2	Collection of data of manurial experiments conducted in the past—*contd.*	*Base Exchange.*—In several provinces special studies of the exchangeable bases of the different soils are in progress. The correlation of these results with those of fertiliser experiments will undoubtedly be very profitable.	No action required.
7	,,	Ditto .	*Period of experiments.*—From the weather sampling point of view, a minimum of five years period was recommended. From the point of view of the cumulative effect of fertilisers a minimum period of three full rotations, *i.e.*, generally nine years was recommended.	The attention of Agricultural Departments will be drawn to this recommendation.
8	,,	Ditto .	It was suggested that the Statistician should issue a small pamphlet containing instructions on statistical analyses which would be of use to all experimenters. This might contain the prescribed methods of statistical analysis and give examples.	This is receiving attention.
9	,,	Ditto .	The following two Resolutions were passed :— " 1. That the survey of manurial experiments carried out in India establish the importance and suitability of indigenous organic manures like cattle manure, green manures, bone-meal, fish-manure, oil cakes ;	Noted.
			2. That artificial fertilisers give the best results in conjunction with organic manures or in the presence of adequate supplies of organic matter in the soil."	Noted.

10	„	Ditto	*Future Programme of Work.*—The continuation of all long term manurial experiments in the provinces was recommended. It was brought to the notice of the Committee that the land on which the experiments were conducted at Cawnpore, United Provinces, was transferred to the Agricultural College as an instructional Farm and it could not be said with certainty whether it was possible to revive the experiments on these plots, The Committee regretted the discontinuance of the former set of experiments which were initiated nearly half a century ago and decided that an enquiry be made from the United Provinces Government as to whether the experiments could be revived.	This recommendation has been approved by the Advisory Board.
11	„	Ditto	The following types of manurial experiments, were recommended in order of importance :— (1) Further investigation of the exact manurial value of Farm-yard manure. (2) On investigation into residual effects of manures—especially organic manures (including oil cakes and bone-meal). (3) Investigation of the best Nitrogen Phosphate ratios for important crops. (4) A study of the effect of phosphatic manures on the yields of pulses and of green manure crops. (5) Experiments with Potassium Nitrate. (6) Investigations into the effect of Potash manures on disease resistance.	

Serial No.	Item No. of the Agenda.	Subject.	Recommendation of the Committee.	Action taken.
11	2	Collection of data of manurial experiments conducted in the past—*concld.*	(7) Experiments on the relative value of the ammonium phosphate type of fertilisers and mixtures containing both soluble nitrogen and phosphates. (8) Experiments to compare farmyard manure made by the loose box method with composts in which urine is mixed, and with urine earth. (9) Residual effect experiments on (*a*) farmyard manure, (*b*) oil cakes; (*c*) bone-meal; (*d*) oil cakes *plus* bone-meal; (*e*) Sulphate of Ammonia *plus* Super-Phosphates. (10) Experiments on the liming soils to ascertain the effect of liming on both the yield and the chemical composition of fodder crops were recommended in provinces where there is a large *Jowar* area with acid soils. The experiment might also be tried on rice lands in Kanara and on Jowar lands in Surat. The Committee agreed that experiments should be carried out with all the crops included in one standard rotation in each province.	
12	3	Enquiry into the question of the market for superphosphates in India.	It was decided to drop the question for the present.	No action required.

13	4	Investigation of the possibility in India of making Nitrogen from the air.	It was decided that the Director of Indian Institute of Science, Bangalore, who is a member of the Advisory Board of the Council, be asked to advise in the matter and furnish information as to the price per unit of electric energy which could be paid and the smallest economic plant.	The Director of the Indian Institute of Science, Bangalore, has been addressed on the subject.
14	5	The need for an all-India Fertilisers Act.	It was agreed that the matter should be put before the next meeting of the Advisory Board. Meanwhile the members from each province undertook to examine the practicability of a law insisting on labels stating the composition of he manure and the desirability of prohibiting ready made mixtures of unstated composition. It was also considered that the opinions of fertiliser manufacturers should be obtained and laid before the Board.	The Advisory Board has recommended certain preliminary action to be taken.
15	6	Existing condition of the fishing industry and its possibilities of development in so far as supplies of fish manure are concerned.	The Committee recorded its opinion that, on the information before it, fish manure was valuable as manure and as food for livestock and recommended its development by the provinces concerned.	The Advisory Board accepted this recommendation.
16	7	Possibilities of establishing a fish guano industry on the Chilka Lake.	The Committee decided to take no further action in the matter.	No action required.
17	8	Experiments on some methods of disintegrating bones by previous fermentation.	The Committee agreed that schemes be invited with a view to (*i*) work being undertaken for purposes of demonstration on the basis of the experiments carried out by Rao Bahadur Sahasrabudhe and Dr. Lander and (*ii*) experiments in composting crushed bones using if possible the "prize" crusher if it passed its practical trials.	The Advisory Board accepted this recommendation.

Serial No.	Item No. of the Agenda.	Subject.	Recommendation of the Committee.	Action taken.
18	9	Economics of Bone-meal production : data in regard to collection, transportation of bones, etc.	It was decided that the Questionnaire be circulated to all Provincial Departments of Agriculture.	The Boards of Economic Enquiry, Punjab, and United Provinces were addressed on the subject
19	10	Question of concession rates for the carriage of bone-meal.	The Committee considered that individual cases might be taken up with the local railway advisory committees. If an official reference was necessary it should be made through the Local Government.	No action required.
20	11	Levy of a duty on the export of oil-seeds, bone and bone-meal.	The Committee considered that in the present circumstances no action should be taken in the direction of levying an export duty.	Noted.
21	12 (*i*)	Proposals that Agricultural Departments should experiment with Nitrate of Potash as a source of Nitrogen in place of imported Nitrogenous manures.	The Committee noted that this had been included in the future programme of work recommended by the Committee under Subject No. 2 of the Agenda.	No action needed.
22	12 (*ii*)	Suggestion by Messrs. The Cawnpore Chemical Works Ltd., Cawnpore, regarding the use of bone superphosphate in place of imported rock superphosphate as manure by Agricultural Departments in India.	The Committee expressed the opinion that bone phosphate contained nitrogen and was therefore a better fertiliser than rock superphosphate. Agritural Departments already recommend the use of the former wherever available.	The firms have been informed.

23	13	Use of Poudrette as manure	It was decided to record the papers	Recorded.
24	14	Conservation of cattle dung for use as manure (Note by Mr. F. L. Brayne, M.C., I.C.S.).	The Committee was of the opinion that it is well known that cow dung has a high manurial value and its use as fuel is declining gradually and that no action is called for on the part of the Committee.	Noted.
25	15	Application from the Government of Madras for a grant of Rs. 92,487 spread over a period of 3 years for a scheme of research for improving the fishing industry and developing the supply of fish manure.	The Committee recommended the scheme on account of the high feeding and manurial value of fish meal and fish manure, subject to the condition that the Madras Government revives the measures previously adopted for the development of deep-sea fishing.	Placed on the Agenda for the meeting of the Advisory Board which has recommended the Scheme for sanction.
26	16-A	Note by the Statistician to the Council on the comparative manurial value for sugarcane of oil cake and ammonium sulphate.	The subjects were covered by the future programme of work already proposed by the Committee and no further action was considered necessary.	Noted.
27	16-B	Proposal by Rao Bahadur D. L. Sahasrabudhe that Provincial Directors of Agriculture be recommended to take up experiments to determine the residual effects of bulky manures on important soils in their provinces.		
28		Mr. Ramadas Pantulu considered that in view of the terms of reference to this Committee, it was necessary for the Committee to submit a formal report on the subject. As they were not in a position to prepare a final report at the present stage, it was decided that a draft interim report should be prepared by the Council's Secretariat indicating the recommendations made by the Committee so far and circulated to the members of the Committee for approval.		This is being done.

APPENDIX VII.

[*Cf.* page 63.]

Members of the Sugar Committee of the Imperial Council of Agricultural Research.

1. Diwan Bahadur Sir T. VIJAYARAGHAVACHARYA, K.B.E., Vice-Chairman, Imperial Council of Agricultural Research. *Chairman.*
2. The Agricultural Expert, Imperial Council of Agricultural Research.
3. Chowdhry MUKHTAR SINGH, Pleader, Meerut City.
4. P. B. RICHARDS, Esq., A.R.C.S., F.E.S., Director of Agriculture, United Provinces.
5. WALCHAND HIRACHAND, Esq., Phœnix Building Ballard Estate, Fort Bombay.
6. Khan Bahadur FATEH-UD-DIN, B.A., M.R.A.S.(E.), A.R.H.S., I.A.S., Offg. Director of Agriculture, Punjab, Lahore.
7. D. R. SETHI, Esq., M.A., B.Sc., I.A.S., Director of Agriculture, Bihar and Orissa.
8. Rao Bahadur T. S. VENKATRAMAN, B.A., I.A.S., Government Sugarcane Expert, Imperial Sugarcane Breeding Station, Lawley Road, P. O. *viâ* Coimbatore.
9. Lala HAR SAHAI GUPTA, B.A., Zamindar of Billari, Billari P. O., District Moradabad, U. P.
10. Sardar Bahadur Sir SUNDAR SINGH, MAJITHIA, K.C.I.E., Zamindar, Punjab, Majithia House, Albert Road, Amritsar.
11. S. V. RAMAMURTY, Esq., I.C.S., Director of Agriculture, Madras.
12. The Director of Agriculture, Mysore, Bangalore.
13. M. CARBERY, Esq., Agricultural Chemist to Government of Bengal, Dacca.

Rai Sahib MALIK CHARAN DAS, *Secretary.*

Co-opted Members.

14. NOEL DEERR, Esq., Begg Sutherland & Co., Cawnpore.
15. F. A. SHERWANI, Esq., The Neoli Sugar Factory, Soron, District Etah.
16. Haji ABDOOLA HAROON, M.L.A., Napier Road, Karachi.
17. SARANGDHAR DAS, Esq., Muhammadia Bazar, Chandnichowk P. O., Cuttack, (Orissa), B. N. Rly.
18. J. F. MILLAR, Esq., the Belapur Company, Ltd., P. O. Harigaon (District Ahmednagar).
19. Khan Bahadur SAYID MUHAMMAD HADI, Adviser on open pan Indian sugar to the Government of the United Provinces, Sultanpur.
20. Lala SHRI RAM, 20-22, Curzon Road, New Delhi.
21. Lala HARI RAJ SWARUP, M.L.A., Rais, Rambagh, Muzaffarnagar, (U. P.).
22. D. R. NARANG, Esq., The Basti Sugar Mills Co., Ltd., Basti.

APPENDIX VIII (*cf.* page 63).

Statement showing the recommendations contained in the proceedings of the Sixth Meeting of the Sugar Committee.

Item No. of Agenda.	Subject.	Recommendation of the Committee.	Action taken.
1	Decisions of the Governing Body on the recommendations of the Sugar Committee, Fifth Meeting.	Noted	No action required.
2	Utilisation of Molasses—Power alcohol.	The most important step is to carry out an experiment in the marketing and distribution of power alcohol in admixture with petrol as motor fuel. It is desirable to carry out a commercial experiment in the use of power alcohol in a limited area. Government should meet the cost of equipping two existing commercial distilleries with the special distilling plant required for the production of absolute alcohol and arrange for these to be worked by the owners of the distilleries. An experiment of this nature would afford the basic data on which Government could come to a decision on the question whether legislation would be justified requiring all petrol in India to be mixed with alcohol.	The question has been taken up with the other Departments of the Government of India.
3	Progress report on the experiments conducted by the Government of Bihar and Orissa in devising a satisfactory small-power sugarcane crushing mill.	Recorded. It was suggested that as most of the provinces which had received grants from the Council for experiments in designing cane crushers had now completed their work, a pamphlet should be compiled summarising the results.	Necessary action will be taken in due course.

APPENDIX VIII (*cf.* page 63).

Statement showing the recommendations contained in the proceedings of the Sixth Meeting of the Sugar Committee.

Item No. of Agenda.	Subject.	Recommendation of the Committee.	Action taken.
4	A test report on the "Phœnix" Cane Crusher by the Sugar Technologist, Imperial Council of Agricultural Research.	(i) The Sugar Technologist should be allowed to test private mills and that the test reports may be published at the discretion of the Council ; (ii) Test reports, whether central or provincial, should be first considered by the Sugar Committee which will decide regarding their publication.	Noted by S. T.
5	Interim report on the experiments conducted by the Sugar Technologist in the construction and testing of an improved juice-boiling *bel*.	Certain suggestions were made by the Committee in regard to further experiments.	Communicated to the Sugar Technologist for necessary action.
6	Annual reports of the sugarcane seedling testing station, Dacca, for the years 1931-32 and 1932-33.	Rao Bahadur Venkataraman may be asked to draft a standard form for such reports.	He has submitted a draft.
7	Annual report of the sugarcane station at Karnal for 1932-33.	Ditto.	Ditto.
8	Report on the sugarcane research scheme, Bihar and Orissa, for the year 1932-33.	The Report was approved	No action required.
9	Report on the scheme of research work on the Mosaic and other diseases of sugarcane for the period June 1932 to June 1933.	Ditto	Ditto.

10	Note by the Sugar Technologist on certain proposed changes in the programme of work and equipment of the Research and Testing Station for indigenous systems of *Gur* and Sugar manufacture.	The Committee approved the proposals made by the Sugar Technologist and also recommended that he should study the economics of vacuum pan factories to suit the requirements of (*a*) Khandsaris of Northern India and (*b*) small agricultural sugar manufacturers such as those in South India, the plant in the latter case costing not more than Rs. 10,000.	The Sugar Technologist addressed accordingly.
11	Scheme for an Imperial Sugar Research Institute as revised by the sub-committee.	(i) That the H. B. T. I., Cawnpore, should be utilised for the proposed Research Institute if satisfactory arrangements can be made with the United Provinces Government. (ii) That the Imperial Sugarcane Breeding Station, Coimbatore, should be made a part of the proposed Sugar Research Institute.	The recommendations are under consideration of the Government of India. Not accepted by the Advisory Board.
12	Proposals for the initiation of future research into the insect pests of sugarcane.	The report of the special committee was adopted .	The Advisory Board recommended that the central portion of the scheme should be prepared first. This is awaited from the Director, Pusa.
13	Application from the Government of Bihar and Orissa for a grant of Rs. 6,000 spread over a period of three years for a scheme of investigation on the possibilities of manufacturing Khandsari sugar by the single-pan method.	Recommended	Sanctioned.
14	Application from the Government of Madras for a grant of Rs. 45,000 spread over a period of five years for a scheme of research work on the chemistry of sugarcane.	Recommended subject to the condition that the question of leave contribution be further discussed with the Madras Government.	Has been approved by the Advisory Board and will be considered by the Governing Body in January 1935.

APPENDIX VIII (*cf.* page 63).

Statement showing the recommendations contained in the proceedings of the Sixth Meeting of the Sugar Committee.

Item No. of Agenda.	Subject.	Recommendation of the Committee.	Action taken.
15	Scheme for research work on the development morphology and anatomy of sugarcane-sorghum hybrids and of the Indian sugarcane and wild saccharums—Note by Prof. Ekambaram of the Madras University.	Approved	Has been approved by the Advisory Board and will be considered by the Governing Body in January 1935.
16	Application from the Government of Baroda for a grant of about Rs. 25,000 spread over a period of five years for a Technological section to be attached to the Sugarcane Investigation Station at Vyara.	The present scheme may be dropped, and a revised scheme, modified in the light of the discussion which had taken place, be submitted later on.	The Government of Baroda informed accordingly.
17	Proposal by the Sugar Technologist, Imperial Council of Agricultural Research for an Indian Sugar Trade Information Service devoted exclusively to the Indian industry and the Indian markets.	Approved with slight modifications. It was desired that it should be brought into operation as early as possible.	Sanctioned by the Governing Body at its last meeting held in November, 1933.
18	Note on the utilisation of bagasse for the paper and board industries by Mr. M. P. Bhargava.	The Forest Research Institute should be requested to undertake more extended experiments in the manufacture of paper, etc., from sugarcane bagasse.	Necessary action taken accordingly.

19	Resolutions passed by the Board of Industries, United Provinces, relating to the sugar industry.	Noted	No action.
20	Minimum prices and sliding scale prices for sugarcane.	That in present circumstances and since protection has been granted to the sugar industry, it is necessary that steps should be taken to secure an equitable distribution of profits between the grower and the miller ; That the fairest way to insure an equitable distribution would be to link in some way the price for cane paid to the grower with the market price of sugar and preferably also with the quality of cane ; That legislation is necessary for securing such price regulation ; That the settlement of a suitable formula should be left to provincial Governments, provided that in the case of adjoining provinces, they should meet in a conference and then come to a mutually agreed decision.	Sugarcane Act, 1934, which has since been enacted, enables local Governments to take necessary action.
21	Indian Sugar and Protection—an economic aspect of the question by Mr. Noel Deerr.	Recorded after further discussion	Recorded.
22	Levy of consultation fees for work done by the Sugar Technologist, Imperial Council of Agricultural Research, for Khandsari factories.	The scale of fees proposed by the Sugar Technologist was approved.	Sanction of the Governing Body obtained in circulation.

APPENDIX VII (*cf.* page 63.)

Statement showing the recommendations contained in the proceedings of the Sixth Meeting of the Sugar Committee.

Item No. to Agenda.	Subject.	Recommendation of the Committee.	Action taken.
23-A	Report on the working of the Padegaon Sugarcane Research Station in the Bombay-Deccan for the year ending 30th June 1933.	As members had not had sufficient time to study the report, discussion was postponed to the next meeting.	Will be included in the Agenda for the next meeting of the committee. Also placed before the Advisory Board, *vide* item 23 (ii) of the Agenda, February 1934 meeting.
23-B	Statement showing the grants received from the Government of India for sugar research and their allocation.	Recorded	Recorded.
23-C	Correspondence with the Indian Sugar Mills Association regarding their representation at the Sixth Meeting of the Sugar Committee.	The existing practice be maintained, namely that the co-opted members are appointed by name; if the Ass ciation wished to change its representatives, it might ask them to resign so that new members might then be co-opted by the Committee. This privilege should not be used too frequently.	The Association informed accordingly.

APPENDIX IX.

[*Cf.* page 88.]

Personnel of the Soil Science Committee of the Imperial Council of Agricultural Research.

1. The Vice-Chairman, Imperial Council of Agricultural Research, Chairman, *ex-officio.*
2. The Agricultural Expert, Imperial Council of Agricultural Research.
3. Mr. A. P. CLIFF, Deputy Director of Agriculture, North-Bihar Range, Muzaffarpur, Bihar and Orissa.
4. Dr. J. K. BASU, Soil Physicist, Sugarcane Research Scheme, Padegaon, Bombay-Deccan.
5. Rao Bahadur B. VISWANATH, F.I.C., Imperial Agricultural Chemist.
6. Dr. KRISHNAN, Agricultural Chemist to the Government of Hyderabad.
7. Dr. E. MACKENZIE TAYLOR, M.B.E., Ph.D., D.Sc., F.I.C., Director, Irrigation Research, Punjab.
8. The Agricultural Chemist to the Government of the Central Provinces.
9. Dr. J. C. GHOSH, D.Sc., Head of the Department of Chemistry, Dacca University, Dacca.
10. The Secretary, Imperial Council of Agricultural Research, Secretary, *ex-officio.*

APPENDIX X.

[*cf.* OF PAGE 88.]

Recommendation of the Soil Science Committee, First Meeting, February 1934 and action taken thereon.

Subject.	Recommendation of Soil Science Committee.	Recommendation of the Advisory Board.	Action taken.
1. Application from the Government of Bengal for a continuation grant of Rs. 18,800 spread over three years for research into the properties of Colloid Soil Constituents by Professor J. N. Mukherjee of the Dacca University.	In view of the value and importance of the research work, the scheme was recommended for sanction, subject to— (*i*) the salary of the Research Assistant being fixed at the scale 250—275—300 per mensem. (*ii*) The saving of about Rs. 900 effected from the provision for salary of the Research Assistant being utilised for additional equipment and travelling allowance for the assistants.	Report of the Soil Science Committee adopted.	Being placed before the Governing body.
2. Application from the Government of the Punjab for a grant for a scheme to investigate the changes in the micro-flora of kallar and alkaline soils during reclamation.	Recommended for sanction. In addition to the number (or density) of the micro-organisms, their type, relative activity and habitat should also be included in the programme of work.	The recommendation of the Soil Science Committee was adopted.	Being placed before the Governing Body.
		Mr. Jenkins, the Chief Agricultural Officer, Sind should be asked to submit a separate scheme for similar work in Sind as conditions of Sind soils were different.	Proposals in respect of Sind are awaited.

3. Report on the investigations carried out by Dr. A. N. Puri, on the standardisation of physico-chemical "Single-Value" measurements most suitable for Indian soils.	The Committee noted that the method was being tried out by certain provinces. The Committee considered that the Indian Society of Soil Science (Indian National Section of the International Society of Soil Science) will probably afford facilities for co-operative testing of methods of soil analysis in future.	Report of Soil Science Committee adopted.	No action.
4. Third International Congress of Soil Science to be held at Oxford in July-August 1935.	The proposal that the Council should meet the expenses of one member who will be the leader of the Indian delegation, is approved. This representative should, if possible, be the first President of the Indian National Section of the International Society of Soil Science now under formation. Otherwise, the National Section should elect a national representative. Action taken by the Council's Secretariat to bring the Congress to the notice of Agricultural Departments, etc., was approved. The Committee considered it extremely important that there should be a strong Indian delegation.	The Committee's recommendations were adopted.	The proposal is being circulated to the Governing Body.
5. Formation of an Indian National Section of the International Society of Soil Science.	The arrangements in progress were noted. The Committee endorsed the view that the Indian National Section should be essentially an unofficial organisation. The draft scheme and bye-laws were considered generally appropriate and the Committee commended these to the careful consideration of the Government of India.	The Committee's report was adopted.	No action on the part of the Council.

APPENDIX XI.

[*Cf.* page 117.]

The principal recommendations made by the Editorial Committee of the Imperial Council of Agricultural Research on 17th February 1934.

That the 'Instructions to Authors of Publications of the Imperial Council of Agricultural Research' be republished in the first number of each Journal every year and that a notice be inserted in a prominent place in all the issues of the Journals drawing attention to the issues in which they were last published.

That the quality of the illustrations in the Council's publications should be maintained at a high level, and, as far as possible, should be the best obtainable in India.

That a new series of 'Miscellaneous Bulletins of the Imperial Council of Agricultural Research' should be started.

It would be preferable to enlarge the size of the present quarterly parts of the 'Indian Journal of Veterinary Science and Animal Husbandry', rather than increase the number of parts issued annually.

That the 'Indian Journal of Veterinary Science and Animal Husbandry' should not accept purely clinical articles but that suitable clinical notes coming from Veterinary Colleges in India be collected together and published periodically as a 'Miscellaneous Bulletin of the Imperial Council of Agricultural Research'.

That arrangements be made, as a trial for a year, for publishing in the 'Indian Journal of Veterinary Science and Animal Husbandry', abstracts of such articles of general practical interest appearing in foreign literature as would assist field workers to keep in touch with current developments.

That for 'Agriculture and Livestock in India', without excluding the kind of material now being published in it, special popular articles on agricultural and animal husbandry subjects be invited from suitable writers and that such contributions be paid for, and this arrangement be tried for a year in the first instance.

That an endeavour should be made to secure for 'Agriculture and Livestock in India', original contributions from practical farmers on suitable topical subjects.

That papers in pure botany which are of interest to agricultural workers in India should not be excluded from the 'Indian Journal of Agricultural Science'.

That free copies of the Council's Journals be supplied to important publishers of agricultural and veterinary books in India and abroad, with a view to making the Journals better known among such publishers.

That with a view to introducing the Council's Journals to as large a number as possible of those interested in such subjects in other countries, arrangements be made for the issue of a circular notice to interested publishers, libraries, etc., giving particulars of the Council's journals, together with suitable specimen articles from each Journal.

APPENDIX XII.

[*Cf.* page 123.]

[Para. 32 of Report.]

List of Journals received in the Library, Imperial Council of Agricultural Research, New Delhi.

Agricultural Engineering.

1. IMPLEMENT AND MACHINERY REVIEW (England). Vol. 55. (1930 to date).

Agriculture.

2. AGRICOLTURA COLONIALE (Italy). 1934.
3. AGRICULTURAL JOURNAL OF BRITISH GUIANA. Vol. 1. (1928 to date).
4. AGRICULTURAL JOURNAL, FIJI. Vol. 3. (1930 to date).
5. AGRICULTURAL INDEX (U. S. A.) (1932 to date).
6. AGRICULTURE AND LIVE-STOCK IN INDIA. Vol. 1. (1931 to date).
7. ALLAHABAD FARMER. Vol. 4—(1930 to date).
8. AMERICAN SOCIETY OF AGRONOMY, JOURNAL OF (New York). Vol. 21—(1929 to date).
9. BULETINUL CULTIVAREI SI FERMENTAREI TUTUNULUI. (Bulletin de l'Institute Experimental pour la culture et la fermentation du tabac). (Rumania). Vol. 21. (1932 to date).
10. BULLETIN OF APPLIED BOTANY OF GENETICS AND PLANT BREEDING. Lenin Academy of Agricultural Sciences in U. S. S. R. Institute of Plant Industry). 13 Series. (1931 to date).
11. CYPRUS AGRICULTURAL JOURNAL. Vol. 25—(1930 to date).
12. EMPIRE JOURNAL OF EXPERIMENTAL AGRICULTURE (England). Vol. 1—(1933 to date).
13. EXPERIMENT STATION RECORD. (U. S. Department of Agriculture). Vol. 62—(1930 to date).
14. FARMING IN SOUTH AFRICA (Pretoria). Vol. 8. (1933 to date).
15. GARDENING REVIEW, (Madras) 1934.
16. GIORNALE DI RISICOLTURA (Italy). Vol. 20. (1930 to date).
17. IMPERIAL INSTITUTE, BULLETIN OF THE (England). Vol. 10. (1912 to date).
18. INTERNATIONAL BULLETIN OF PLANT PROTECTION (International Institute of Agriculture, Rome). Vol. 3. (1929 to date).
19. JOURNAL OF AGRICULTURAL RESEARCH (U. S. A.). Vol. 41—(1930 to date).
20. JOURNAL OF AGRICULTURAL SCIENCE (England). Vol. 1—(1905 to date).
21. 'KISAN' (Patna). Vol. 1. (1933 to date).
22. MADRAS AGRICULTURAL JOURNAL. Vol. 19. (1930 to date).
23. MALAYAN AGRICULTURAL JOURNAL. Vol. 18. (1930 to date).
24. MINISTRY OF AGRICULTURE, JOURNAL OF THE (England). Vol. 20. (1913-14 to date).
25. MONTHLY BULLETIN OF AGRICULTURAL ECONOMICS AND SOCIOLOGY (International Institute of Agriculture, Rome). Vol. 1—(1910 to date).

26. MONTHLY BULLETIN OF AGRICULTURAL SCIENCE AND PRACTICE. (International Institute of Agriculture, Rome). Vol. 1—(1910 to date).
27. MONTHLY CROP REPORT AND AGRICULTURAL STATISTICS. (International Institute of Agriculture, Rome). Vol. 1—(1910 to date).
28. NEW ZEALAND JOURNAL OF AGRICULTURE. Vol. 40—(1930 to date).
29. OFFICIAL RECORD. (U. S. Department of Agriculture). Vol. 9. (1931-33) (*Ceased Publication.*)
30. PHILIPPINE JOURNAL OF AGRICULTURE, MANILA. Vol. 2—(1931 to date).
31. PLANT BREEDING ABSTRACTS. (Imperial Bureau of Plant Genetics). Vol. 1. (1930 to date).
32. PLANTERS CHRONICLE. (Coonoor, Madras) 1934.
33. REVIEW OF AGRICULTURAL OPERATIONS IN INDIA. (1919 to date).
34. RHODESIA AGRICULTURAL JOURNAL. 1934.
35. RUBBER RESEARCH INSTITUTE, MALAYA, JOURNAL OF THE Vol. 1—(1929 to date).
36. SEASONAL NOTES (Punjab Agricultural Department). Vol. 7—(1930 to date).
37. SOUTH EASTERN AGRICULTURAL COLLEGE, WYE, KENT, JOURNAL OF THE 1907 to date.
38. TASMANIAN JOURNAL OF AGRICULTURE. Vol. 1—(1930 to date).
39. TROPICAL AGRICULTURE (Trinidad). Vol. 7—(1930 to date).
40. TROPICAL AGRICULTURIST (Ceylon). Vol. 41-58, 73—(1929 to date).
41. TREUBIA (Dutch East Indies). Vol. 1. (1919 to date).
42. WEST INDIA COMMITTEE CIRCULAR. Vol. 47—(1932 to date).

Animal Husbandry and Dairying.

43. ANIMAL BREEDING ABSTRACTS. (Imperial Bureau of Animal Genetics). Vol. 1—(1933 to date).
44. AYRSHIRE CATTLE SOCIETY'S JOURNAL. 1934.
45. BLOOD-STOCK BREEDERS' REVIEW. (England). Vol. 18—(1929 to date).
46. FARMER AND STOCK-BREEDER. (England). 1931 to date.
47. GAZETTE OF THE PHILIPPINE ISLANDS, BUREAU OF ANIMAL INDUSTRY. 1934.
48. HORSE BREEDING. (Delhi). Vol. 9—(1933 to date).
49. HARPER ADAMS UTILITY POULTRY JOURNAL. Vol. 17,—(1931-32 to date).
50. INDIAN POULTRY GAZETTE. Vol. 21—(1932 to date).
51. INTERNATIONAL REVIEW OF POULTRY SCIENCE (Holland). Vol. 4—(1931 to date).
52. JOURNAL OF THE BRITISH DAIRY FARMER'S ASSOCIATION. Vol. 43—(1931 to date).
53. JOURNAL OF DAIRY RESEARCH (England). Vol. 1—(1929 to date).
54. JOURNAL OF DAIRY SCIENCE (U. S. A.). Vol. 13—(1930 to date).
55. LIST OF REFERENCES FROM CURRENT LITERATURE. (Issued by the National Institute for Research in Dairying, Near Reading). 1931 to date.
56. NUTRITION ABSTRACT AND REVIEWS. (Impl. Bureau of Animal Nutrition). Vol. 1—(1931 to date).

57. ONDERSTEPOORT JOURNAL. (South Africa, Pretoria). Vol. 1—(1933 to date).
58. POULTRY AND POULTRY HUSBANDRY (England). (1931 to date).
59. POULTRY SCIENCE. (U. S. A.). Vol. 1—(1921-22 to date).

Biology, Heredity and Genetics.

60. BIOLOGICAL ABSTRACTS. (U. S. A.). Vol. 1—(1927 to date).
61. BIOLOGICAL BULLETIN. (U. S. A.). Vol. 60—(1931 to date).
62. BIOLOGICAL REVIEWS. (England). Vol. 7—(1932 to date).
63. GENETICS. (U. S. A.). Vol. 15—(1930 to date).
64. HERBAGE ABSTRACTS. (Imperial Bureau of Plant Genetics). Vol. 1—(1931 to date).
65. JOURNAL OF GENETICS. (England). Vol. 21—(1929 to date).
66. JOURNAL OF HEREDITY. (U. S. A.). Vol. 21—(1930 to date).
67. QUARTERLY BULLETIN. (Imperial Bureau of Animal Genetics). Vol. 2—(1931-32).
68. QUARTERLY REVIEW OF BIOLOGY. (U. S. A.). Vol. 5—(1930 to date).

Botany and Mycology. (See also Genetics).

69. BULLETIN DU JARDIN BOTANIQUE. (Buitenzorg). Vol. 1—(1919 to date).
70. BULLETIN OF MISCELLANEOUS INFORMATION. (Kew Gardens). (1888-1889, 1901, 1906-18 and 1931 to date).
71. DER ZUCHTER. (Germany). Vol. 2—(1930 to date).
72. DIE ERNAHRUNG PER PFLANZE. (Germany). Vol. 27—(1931 to date).
73. HORTICULTURAL ABSTRACTS. (Imperial Bureau of Fruit Production). Vol. 1—(1931 to date).
74. INDIAN BOTANICAL SOCIETY, JOURNAL OF THE —. Vol. 1—(1919-20 to date).
75. NATIONAL INSTITUTE OF AGRICULTURAL BOTANY, JOURNAL OF THE —. (England). Vol. 1—(1924 to date).
76. REVIEW OF APPLIED MYCOLOGY. (England). Vol. 1—(1922 to date).
77. TROPENPFLANZER. (Germany). 1930 to date.

Chemistry and Biochemistry. (See also Soil Science).

78. CHEMICAL SOCIETY, JOURNAL OF THE—. (England).—1928 to date.
79. INDIAN CHEMICAL SOCIETY, JOURNAL OF THE—. Vol. 10—(1933 to date).
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84. COMMERCE. (Calcutta). Vol. 44—(1932 to date).

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86. COMMERCIAL GAZETTE. (Calcutta). 1933 to date.
87. COMMERCIAL AMERICA. Vol. 29—(1932 to date).
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90. INDIAN TRADE JOURNAL. Vol. 1-5, 7-27, 29-47 and 93—(1929 to date).
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93. MANCHESTER GUARDIAN COMMERCIAL SUPPLEMENT. 1932 to date.
94. MADRAS PRICE CURRENT AND MARKET REPORT. 1932 to date.
95. MONTHLY SURVEY OF BUSINESS CONDITIONS IN INDIA. Vol. 1—(1933 to date).
96. TIMES ENGINEERING AND COMMERCIAL SUPPLEMENT. (England). 1932 to date.
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98. EMPIRE COTTON GROWING REVIEW. (England). Vol. 1—(1924 to date).
99. FINANCIAL NEWS. (Bombay). (Previously called 'Cotton and Finance). Vol. 7—(1931 to date).
100. INTERNATIONAL COTTON BULLETIN. (Manchester). Vol. 7—(1929 to date).
101. RAW COTTON TRADE STATISTICS. (Dept. of Commercial Intelligence and Statistics, India). (1931-32 to date).
102. SUMMARY OF CURRENT LITERATURE. (British Cotton Industry Research Association). (England). Vol. 11—(1931 to date).
103. TEXTILE INSTITUTE, JOURNAL OF THE. (Manchester). Vol. 21—(1930 to date).

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105. BOMBAY CO-OPERATIVE QUARTERLY. Vol. 15—(1931 to date).
106. BULLETIN ECONOMIQUE DE L'INDOCHINE. Vol. 34—(1931 to date).
107. B. & O. CO-OPERATIVE JOURNAL. Vol. 9—(1931 to date).
108. ECONOMIC HISTORY. (A supplement of Economic Journal.) (England). Vol. 2—(1931 to date).
109. ECONOMIC JOURNAL. (England). Vol. 20-22, 24-26 and 40—(1930 to date).
110. ECONOMIC JOURNAL. (Afghanistan). 1933 to date.
111. INDIAN FINANCE. 1931 to date.
112. INDUSTRIAL AND LABOUR INFORMATION. (Geneva). Vol. 35—(1930 to date).
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115. REVIEW OF APPLIED ENTOMOLOGY: Series 'A' (Agriculture). (England). Vol. 19—(1931 to date).

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118. INDIAN FOREST RECORDS. Vol. 2—(1910 to date).

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123. INDIAN REVIEW. Vol. 30—(1929 to date).

124. INDIAN ROADS. (I. and L. Department). 1931 to date.

125. INTERNATIONAL REVIEW OF EDUCATIONAL CINEMATOGRAPHY. (Rome). Vol. 3—(1931 to date).

126. INSTITUTE OF BREWING, Journal of the. (England). Vol. 33—(1927 to date).

127. MADRAS UNIVERSITY, Journal of. Vol. 1—(1928 to date).

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129. SUMMARY OF CURRENT LITERATURE. (Department of Scientific and Industrial Research.) (England). Vol. 3—(1930 to date).

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130. LEAGUE OF NATIONS, Monthly Summary of the. Vol. 1—9 and 11 to date.

131. LEAGUE OF NATIONS, Official Journal. 1920 to date.

132. MONTHLY BULLETIN OF STATISTICS. (See under 'Statistics').

133. QUARTERLY BULLETIN OF INFORMATION ON THE WORK OF INTERNATIONAL ORGANIZATIONS. (Geneva). Vol. 3—(1931 to date).

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134. BULLETIN OF HYGIENE. (England). Vol. 6—(1931 to date).

135. JOURNAL OF COMPARATIVE PATHOLOGY AND THERAPEUTICS. (England). Vol. 44—(1931 to date).

136. JOURNAL OF HYGIENE. (England). Vol. 29—(1929 to date).

137. ROYAL SOCIETY OF TROPICAL MEDICINE AND HYGIENE, Transactions of the. (England). Vol. 25—(1931 to date).

138. TROPICAL DISEASES BULLETIN. (England). Vol. 28—(1931 to date).

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139. CURRENT SCIENCE. (Bangalore). Vol. 2—(1933 to date).

140. BOMBAY NATURAL HISTORY SOCIETY, Journal of the. Vol. 8, 11-15, 17-18, 22-28, 33—(1929 to date).

141. NATURE. (England). Vol. 119-120 and 125—(1930 to date).

142. NATURAL AND APPLIED SCIENCE BULLETIN (Philippine University). Vol. 1—(1930 to date).

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156. KATHIAWAR TRADE STATISTICS. 1933 to date.

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158. MONTHLY CROP REPORT AND AGRICULTURAL STATISTICS. (International Institute of Agriculture Rome). (See under 'Agriculture').

159. MONTHLY STATISTICS OF COTTON SPINNING AND WEAVING IN INDIAN MILLS. 1933 to date.

160. MONTHLY STATISTICS OF PRODUCTION OF CERTAIN SELECTED INDUSTRIES OF INDIA. 1932-33 to date.

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162. WHOLE-SALE PRICES OF CERTAIN STAPLE ARTICLES OF TRADE AT SELECTED STATIONS IN INDIA. 1933 to date.

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163. FACTS ABOUT SUGAR (U. S. A.). Vol. 26—(1931 to date).

164. INTERNATIONAL SUGAR JOURNAL (England). Vol. 32—(1930 to date).

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165. AMERICAN VETERINARY MEDICAL ASSOCIATION, Journal of the. Vol. 29—(1930 to date).

166. ANNALES DE L'INSTITUTE PASTEUR. (France). Vol. 46—(1931 to date).

167. ANNALES DE MEDICINE VETERINAIRE. (France). Vol. 76—(1931 to date).

168. AUSTRALIAN VETERINARY JOURNAL. Vol. 7—(1931 to date).

169. BULLETIN DE L'INSTITUTE PASTEUR. (France). Vol. 29. (1931 to date).

170. BULLETIN DE L'ACADEMIE VETERINARY DE FRANCE. Vol. 4—(1931 to date).

171. INDEX VETERINARIUS. (Impl. Bureau of Animal Health). Vol. 1—(1933 to date).

172. INDIAN JOURNAL OF VETERINARY SCIENCE AND ANIMAL HUSBANDRY. Vol. 1—(1931 to date).

173. INDIAN VETERINARY JOURNAL. Vol. 7—(1930 to date).

174. JAPANESE SOCIETY OF VETERINARY SCIENCE, Journal of the. Vol. 10—(1931 to date).

175. OFFICE INTERNATIONAL DES EPIZOOTES—Bulletin Mensuel. (France). Vol. 4—(1930 to date).

176. RECUEIL DE MEDICINE VETERINAIRE AND BULLETIN DE LA ACADEMIE VETERINAIRE DE FRANCE. Vol. 107—(1931 to date).

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179. VETERINARY JOURNAL. (England). Vol. 87—(1931 to date).

180. VETERINARY MAGAZINE (U. P.). Vol. 20—(1931 to date).

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183. HELMINTHOLOGICAL ABSTRACTS. (England). 1932 to date.

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186. JOURNAL OF PARASITOLOGY. (U. S. A.). Vol. 17—(1930 to date).

APPENDIX

Annual Accounts for the year 1933-34

Receipts.

Head of account.	Receipts during the year.	Remarks.	Grants.	
			Original.	Net.
	Rs. a. p.		Rs. a. p.	Rs. a. p.
1. Opening balance on 1st April 1933.	5,43,717 6 11	..	9,200 0 0	11,500 0 0
			41,150 0 0	41,200 0 0
2. (*i*) Annual recurring grant from the Government of India for research work.	5,00,000 0 0	..	550 0 0	100 0 0
(*ii*) Grant from the Government of India for research work connected with the promotion of Sugar Industry.	1,50,000 0 0			
3. Donations from the Mysore and Baroda Governments.	10,000 0 0	..	11,300 0 0	9,000 0 0
4. Interest from investment—	..	..	67,000 0 0	1,500 0 0
(*a*) Interest from 5 per cent. loan of 1939-44.	77,525 11 2			
(*b*) Interest from 6 per cent. bonds of 1933-36.	29,925 0 0			
(*c*) Interest from fixed deposits and Government of India treasury bills.	3,854 15 8	..	16,500 0 0	14,000 0 0
5. Receipts from Sugar Cable Service.	8,299 8 0	..	7,500 0 0	200 0 0
			8,400 0 0	8,300 0 0
6. Receipts on account of fees for professional advice given by the Sugar Technologist to Council to Sugar Factories.	1,533 2 0	..	850 0 0	600 0 0
7. Receipts from Sugar Trade Information Service.	1,684 5 0	..	20,000 0 0	20,000 0 0
8. Receipts from the Empire Marketing Board :—				
(*i*) In respect of moiety of expenditure payable for the Bengal and Burma rice schemes.	10,666 11 0	..	23,500 0 0	17,600 0 0
(*ii*) In respect of sale proceeds of consignment of mangoes to England.	4,523 10 3	..	23,050 0 0	29,500 0 0
Carried over	13,41,730 6 0			

XIII (*cf.* page 62).

relating to the grant for research purposes.

Payments.

Payments.			
Head of account.	Expenditure during the year.	Excess—or saving + over net grant.	Remarks.
	Rs. a. p.	Rs. a. p.	
1. Sugar Committee	11,429 10 3	+70 5 9	Inconsiderable.
2. Scheme of Sugar Technologist	40,665 8 2	+534 7 10	Do.
3. Construction and testing of improved juice boiling bel by the Sugar Technologist.	..	+100 0 0	Do.
4. Sugar Cable Service	8,788 13 9	+211 2 3	Do.
5. Grant for the establishment of Research and Testing Station for the indigenous system of gur and sugar manufacture by the Sugar Technologist.	1,298 14 0	+201 2 0	Do.
6. Scheme of Chief Economist	13,729 14 6	+270 1 6	Do.
7. Cost of meetings	189 6 6	+10 9 6	Do.
8. Grant to Coimbatore sugarcane sub-station at Karnal.	6,700 0 0	+1,600 0 0	Do.
9. Grant for Bengal Gur boiling and cane crushing scheme.	574 0 0	+26 0 0	Do.
10. Grant to Harcourt Butler Technological Institute.	20,000 0 0	..	Do.
11. Grant for research on mosaic and other cane diseases at Pusa.	17,600 0 0	..	Do.
12. Grant for the establishment of a sugarcane station in Bihar and Orissa.	29,417 0 0	+83 0 0	Do.
	1,59,393 3 2		

Receipts.

Head of account.	Receipts during the year.	Remarks.	Grants. Original.	Grants. Net.
	Rs. a. p.		Rs. a. p.	Rs. a. p.
Brought forward	13,41,730 6 0			
		Rs.		
9. Receipts from the Indian Central Cotton Committee in respect of moiety of expenditure payable for the "Scheme of Investigation into the Cost of Production of Crops in the principal Sugar and Cotton Tracts in India."	54,858 2 6*	Total receipt 60,000 Deduct half Expenditure. 54,858-2-6 (*vide*, S. Nos. 6, 7 and 16) Balance credit carried forward 5,141-13-6 (See serial No. 14).	5,000 0 0 2,300 0 0 63,100 0 0	3,600 0 0 2,100 0 0 32,000 0 0
10. Receipts realized from various schemes financed by the Council.	3,714 9 9	..	..	..
11. Receipts on account of unspent balances of grants given by the Council in previous years.	360 13 0			
			14,900 0 0	13,500 0 0
			20,400 0 0	15,400 0 0
12. Other Miscellaneous receipts	572 6 0	..	19,200 0 0	16,000 0 0
			10,600 0 0	5,800 0 0
13. Repayment of motor car advance by the Locust Research Entomologist and the Statistician.	912 0 0	..	6,700 0 0	3,700 0 0
14. Deposition account of moiety of expenditure paid by the Indian Central Cotton Committee for the scheme of "Investigation into the Cost of Production of Crops in the Principal Sugarcane and Cotton tracts in India".	5,441 13 6		14,900 0 0 14,900 0 0 4,600 0 0 4,600 0 0 4,600 0 0 4,600 0 0	13,800 0 0 10,000 0 0 4,600 0 0 4,300 0 0 4,600 0 0 3,400 0 0
15. Receipts on account of caution money of candidates seeking admission to the Harcourt Butler Technological Institute, Cawnpore.	2,443 12 0	..	..	3,000 0 0
Total carried over	14,09,733 14 9	...	...	..

relating to the grant for research purposes—contd.

Payments.

Payments. Head of account.	Expenditure during the year.	Excess—or saving +over net grant.	Remarks.
	Rs. a. p.	Rs. a. p.	
Brought forward .	1,50,393 3 2		
13. Grant for designing a satisfactory small power sugarcane crushing mill.	3,620 0 0	—20 0 0	Inconsiderable.
14. Grant for the establishment of a sugarcane seedling testing station, Dacca.	2,060 0 0	+40 0 0	Do.
15. Grant for the Bombay-Deccan sugarcane research scheme.	32,000 0 0	..	Do.
16. Grant for Investigation into the Cost of production of crops in the principal sugarcane and cotton tracts in Indian Provinces :—			
(*a*) Madras	13,500 0 0	..	Do
(*b*) Bombay	15,345 0 0	+55 0 0	Do.
(*c*) Punjab	16,000 0 0	..	Do.
(*d*) Bihar and Orissa	5,800 0 0	..	Do.
(*e*) Bengal	3,700 0 0	..	Do.
(*f*) United Provinces	13,810 0 0	—10 0 0	Do.
(*g*) Central Provinces and Berar ..	10,780 0 0	+20 0 0	Do.
(*h*) Hyderabad	4,580 0 0	+20 0 0	Do.
(*i*) Mysore	4,300 0 0	..	Do.
(*j*) Baroda	4,580 0 0	+20 0 0	Do.
(*k*) Sind	3,402 0 0	—2 0 0	Do.
17. Grant to the Government of United Provinces for investigation into the production of Khandsari Sugar in the United Provinces.	3,000 0 0	..	
Total carried over .	2,86,870 3 2		

Receipts.

Head of account.	Receipts during the year.	Remarks.	Grants.	
			Original.	Net.
	Rs. a. p.		Rs. a. p.	Rs. a. p.
Brought forward .	14,09,733 14 9			
16. Deposit for loan of books from the Sugar Technologist to the Council.	99 0 0	..	41,500 0 0	5,600 0 0
17. Repayment of permanent advance by Mr. Afzal Hussain, Locust Research Entomologist to the Council.	300 0 0	..	30,000 0 0	14,100 0 0
18. Recoveries on account of General Provident Fund and Income Tax, etc.	5,212 2 0	..	33,000 0 0	20,000 0 0
Total Receipts ..	14,15,345 0 9		..	..
Receipts of investments and re-investments from fixed deposits and treasury bills.	26,33,655 4 0		7,400 0 0	...
Grand Total	40,49,000 4 9		21,200 0 0	10,000 0 0
				700 0 0
			59,000 0 0	67,000 0 0
			1,800 0 0	1,800 0 0
			2,000 0 0	700 0 0
			11,600 0 0	5,800 0 0
				300 0 0
			1,500 0 0	100 0 0
			12,000 0 0	11,600 0 0
			5,100 0 0	5,600 0 0
			8,000 0 0	6,500 0 0
			7,000 0 0	1,000 0 0
			23,200 0 0	19,500 0 0
			21,200 0 0	22,600 0 0

relating to the grant for research purposes—contd.

Payments.

Payments.			
Head of account.	Expenditure during the year.	Excess—or saving +over net grant.	Remarks.
	Rs. a. p.	Rs. a. p.	
Brought forward .	2,86,870 3 2		
18. Grant to Government of Madras for Sugarcane research in the Madras Presidency.	5,600 0 0	..	
19. Grant to the Government of Punjab for the establishment of a sugarcane research station in the Punjab.	14,050 0 0	+50 0 0	Inconsiderable.
20. Grant for the Investigation into the various problems of sugar Industry in the United Provinces.	20,000 0 0	..	
21. Grant for research on the genetics of sugarcane at the Imperial Cane-breeding Station, Coimbatore.	..	..	
22. Grant for extension of sugarcane work at the Jorhat Experimental Station, Assam.	10,000 0 0	..	
23. Indian Sugar Trade Information Service	498 4 0	+201 12 0	Do.
24. Special Locusts Research Staff ..	67,114 6 3	—114 6 3	Do.
25. Central Locusts Bureau	1,790 12 6	+9 3 6	Do.
26. Locusts Committee	639 9 0	+60 7 0	Do.
27. Grant to Government of Punjab for Locusts Research.	5,800 0 0	..	
28. Investigations into the rusts of wheat and barley by Dr. K. C. Mehta.	294 14 5	+5 1 7	Do.
29. Fertilizers Committee	10 10 0	+89 6 0	Do.
30. Statistical Section of the Bureau of Agricultural Intelligence.	11,630 1 0	—30 1 0	Do.
31. Consignment of mangoes to the Empire Marketing Board.	5,544 13 9	+55 2 3	Do.
32. Indian Oilseed Crushing Industry Committee.	6,518 7 0	—18 7 0	Do.
33. Award of a prize for a bone-crusher worked by animal and mechanical power.	1,000 0 0	..	
34. Grant for Botanical Sub-station, Karnal	19,461 13 1	+38 2 11	Do.
35. Grant for Agricultural Meteorology, Poona	22,593 3 0	+6 13 0	Do.

Receipts.

Head of account.	Receipts during the year.	Remarks.	Grants.	
			Original.	Net.
	Rs. a. p.		Rs. a. p.	Rs. a. p.
			..	9,400 0 0
			4,300 0 0	3,900 0 0
			48,000 0 0	25,000 0 0
			..	15,500 0 0
			3,000 0 0	2,500 0 0
			6,700 0 0	2,600 0 0
			19,200 0 0	19,100 0 0
			25,400 0 0	..
			25,800 0 0	30,000 0 0
			19,800 0 0	18,500 0 0
			43,450 0 0	37,500 0 0
			21,200 0 0	10,000 0 0
			30,000 0 0	24,000 0 0
			53,400 0 0	16,000 0 0
			20,000 0 0	..
			22,000 0 0	8,000 0 0
			42,200 0 0	10,000 0 0
			22,000 0 0	..
			6,100 0 0	..
			6,950 0 0	7,400 0 0
			2,000 0 0	1,900 0 0

relating to the grant for research purposes—contd.

Payments.

Payments. Head of account.	Expenditure during the year.	Excess—or saving + over net grant.	Remarks.
	Rs. a. p.	Rs. a. p.	
36. Grant to Hyderabad Durbar for the Dry Farming Research Scheme.	9,400 0 0	..	
37. Appointment of a Physical Assistant on the staff of Agricultural Chemist, Bengal.	3,840 0 0	+60 0 0	Inconsiderable.
38. Grant to the Government of Bombay for the Bombay-Deccan Dry Farming Scheme.	25,000 0 0	..	
39. Grant to the Government of Madras for Dry farming Scheme in the Ceded Districts of Madras.	15,500 0 0	..	
40. Grant to the Government of Madras for research on potatoes.	2,430 0 0	+70 0 0	Do.
41. Grant to the Government of Bombay on account of Dr. Uppal's deputation to study various diseases of plants.	2,552 13 0	+47 3 0	Do.
42. Co-ordinated scheme of rice research in—			
(*i*) Madras	19,094 2 8	+5 13 4	Do.
(*ii*) Burma	..	..	
(*iii*) Bengal	30,000 0 0	..	
(*iv*) Central Provinces	18,500 0 0	..	
(*v*) Bihar and Orissa	37,500 0 0	..	
(*vi*) Assam	10,000 0 0	..	
(*vii*) United Provinces	24,011 0 9	—11 0 9	
43. Provincial Schemes of Fruit Research—			
(*i*) Bombay	16,000 0 0	..	
(*ii*) Madras	..	..	
(*iii*) Bengal	8,000 0 0	..	
(*iv*) United Provinces	10,000 0 0	..	
(*v*) Bihar and Orissa	..	..	
(*vi*) Punjab	..	..	
44. Grant to the Dacca University ..	7,337 0 0	+63 0 0	
45. Prof. Mukherjee's scheme of colloid soil constituents.	1,900 0 0	..	

Receipts.

Head of account.	Receipts during the year.	Remarks.	Grants.	
			Original.	Net.
	Rs. a. p.		Rs. a. p.	Rs. a. p.
			3,000 0 0	3,000 0 0
			3,000 0 0	2,200 0 0
			3,800 0 0	4,700 0 0
			2,650 0 0	2,500 0 0
			3,500 0 0	3,400 0 0
			30,800 0 0	30,800 0 0
			..	7,000 0 0
			8,700 0 0	7,700 0 0
			5,000 0 0	5,100 0 0
			49,900 0 0	..
			7,500 0 0	100 0 0
			9,800 0 0	8,100 0 0
			9,200 0 0	8,700 0 0
			9,000 0 0	8,900 0 0
			8,600 0 0	7,400 0 0
			8,500 0 0	7,600 0 0
			6,000 0 0	4,300 0 0
			6,900 0 0	5,900 0 0
			6,000 0 0	3,000 0 0
			15,000 0 0	..
			7,500 0 0	8,600 0 0

relating to the grant for research purposes—contd.

Payments.

Payments. Head of account.	Expenditure during the year.	Excess—or saving + over net grant.	Remarks.
	Rs. a. p.	Rs. a. p.	
46. Prof. Mahalanobis' scheme of Experimental errors in fields trials.	3,000 0 0	..	
47. Prof. Bhatnagar's scheme—			
(*i*) Effects of ions on plant growth ..	2,143 1 7	+56 14 5	Inconsiderable.
(*ii*) Physico-chemical properties and fertility of soil.	4,700 0 0	..	
48. Prof. Dastur's Scheme of rice physiology	2,500 0 0	..	
49. Prof. Chaudhri's scheme of wither Tip of citrus trees.	3,370 0 0	+30 0 0	Do.
50. Dr. Mehta's scheme of rusts of wheat and barley.	30,778 0 0	+22 0 0	Do.
51. Grant to the Burma Shell Oil Storage and Distributing Co., Bombay.	7,000 0 0	..	
52. Appointment of a Physiological Chemist to study animal nutrition.	7,660 0 0	+40 0 0	Do.
53. Dr. Slater's scheme of Goat Breeding ..	5,065 15 0	+34 1 0	Do.
54. Research work at the Anand Creamery into the products of milk.	..	..	
55. Investigation into the most suitable and economic method of combating different types of parasitological infections in the fields.	114 0 0	—14 0 0	Do.
56. Appointment of Veterinary Investigation Officers in Provinces:—			
(*i*) Bombay	8,080 0 0	+20 0 0	Do.
(*ii*) Bengal	8,700 0 0	..	
(*iii*) Punjab	8,850 0 0	+50 0 0	Do.
(*iv*) Bihar and Orissa	7,400 0 0	..	
(*v*) Central Provinces	7,600 0 0	..	
(*vi*) Madras	4,300 0 0	..	
(*vii*) United Provinces	5,900 0 0	..	
(*viii*) Assam	3,000 0 0	..	
(*ix*) North-West Frontier Province ..	..	..	
(*x*) Hyderabad	8,530 0 0	+70 0 0	

Receipts.

Head of account.	Receipts during the year.	Remarks.	Grants.	
			Original.	Net.
	Rs. a. p.		Rs. a. p.	Rs. a. p.
			10,000 0 0	..
			600 0 0	4,500 0 0
			700 0 0	200 0 0
			..	900 0 0
			12,000 0 0	6,300 0 0
			24,000 0 0	24,000 0 0
			22,000 0 0	25,000 0 0
			29,170 0 0	29,200 0 0
			1,330 0 0	1,300 0 0
			750 0 0	700 0
			2,000 0 0	..
			..	130 0 0
			6,000 0 0	7,000 0 0
			9,000 0 0	9,000 0 0
			5,000 0 0	6,000 0 0
			2,000 0 0	2,500 0 0
			1,000 0 0	100 0 0
			500 0 0	700 0 0
			9,000 0 0	10,500 0 0

relating to the grant for research purposes—contd.

Payments.

Payments.			
Head of account.	Expenditure during the year.	Excess—or saving + over net grant.	Remarks.
	Rs. a. p.	Rs. a. p.	
57. Appointment of a Protozoologist ..	..	..	
58. Appointment of a Statistician for the compilation of certain statistics relating to feeding scales in Military Dairies.	4,255 13 0	+244 3 0	Inconsiderable.
59. Participation of India in the 5th World Poultry Congress, Rome.	200 0 0	..	
60. Deputation of India's representatives to the 9th International Dairy Congress, Copenhagen.	878 4 0	+21 12 0	Inconsiderable.
61. Contribution to the International Office of Epizootics, Paris.	6,301 2 0	—1 2 0	Do.
62. Contributions to the Imperial Mycological Institute, London.	24,000 0 0	..	
63. Contribution to the International Institute of Agriculture, Rome.	24,948 8 0	+51 8 0	Inconsiderable.
64. Contribution to the Imperial Agriculture Bureaux, London.	29,166 11 0	+33 5 0	
65. Contribution to the Imperial Institute of Entomology.	1,333 5 0	—33 5 0	Inconsiderable.
66. Cost of representation of India on the Executive Council of the Imperial Agriculture Bureau, London.	600 0 0	+40 0 0	Do.
67. Contribution to the Standing Committee of the wheat exporter's conference.	..	..	
68. Contribution to the Tobacco Federation of the British Empire.	133 5 0	—3 5 0	Inconsiderable.
69. Books and Publications	6,725 10 9	+274 5 3	
70. Accounts and Audit	8,769 0 0	+231 0 0	Inconsiderable.
71. Travelling allowance of non-official members of the Council.	5,850 2 0	+149 14 0	Do.
72. Travelling allowance of visitors other than members attending meetings of the Council.	2,139 0 6	+360 15 6	Do.
73. Editorial Committee	39 12 0	+60 4 0	Do.
74. Miscellaneous	689 10 3	+10 5 9	Do.
75. Cost of exhibits for World's Grain Exhibition and Conference.	10,641 10 9	+141 10 9	Do.

Annual Account for the year 1933-34

Receipts.

Head of account.	Receipts during the year.	Remarks.	Grants.	
			Original.	Net.
	Rs. a. p.		Rs. a. p.	Rs. a. p
			..	2,100 0 0
			..	6,700 0 0

relating to the grant for research purposes—concld.

Payments.

Payments.			
Head of account.	Expenditure during the year.	Excess—or saving + over net grant.	Remarks.
	Rs. a. p.	Rs. a. p.	
76. Sub-Section of Imperial Agricultural Bureaux, London.	2,032 14 8	+67 1 4	Inconsiderable.
77. Enquiry into the supply of coconut products and coconut oil in India.	6,491 2 6	+202 13 6	Do.
78. Motor Car advance to the Statistician to the Council.	1,500 0 0	..	
79. Permanent advance to the Sugar Technologist.	200 0 0	..	
80. Refund of caution money to candidates seeking admission to the Harcourt Butler Technological Institute, Cawnpore.	2,399 8 0	..	
81. Refund of deposit received by the Sugar Technologist for loan of books.	105 0 0		
82. Remittances on account of General Provident Fund and income-tax, etc.	5,430 14 0		
Total Expenditure	9,94,064 7 7		
Investments and re-investments in fixed deposits.	25,33,655 4 0		
By balance	5,21,280 9 2		
GRAND TOTAL	40,49,000 4 9		

II.—Particulars of Advances (Permanent and Temporary) outstanding at the end of the year:—

Particulars.	Amount.
	Rs. a. p.
1. Permanent advance with the Locusts Research Entomologist, Karachi ..	1,000 0 0
2. Permanent advance with the Sugar Technologist, Cawnpore	450 0 0
3. Temporary advance with the Librarian, Imperial Council of Agricultural Research, New Delhi	10 0 0
Total ..	1,460 0 0

III.—Particulars of Securities, etc.—

	Face value.	Purchase value.	Approximate market value.	
	Rs.	Rs.	Rs.	
1. 5% loan of 1939-44 (G. P. notes kept by the Controller of the Currency).	15,54,400	14,99,996	16,67,094	@ 107-4-0 for Rs. 100.
2. Two receipts for 2½% fixed deposit No. 2893, dated 25th July 1933 and No. 2926, dated the 18th August 1933 for Rs. 50,000 each.	1,00,000	1,00,000	1,00,000	
3. Seven receipts for 2½% fixed deposit Nos. 2919 to 2925, dated the 18th August 1933 for Rs. 1,00,000 each.	7,00,000	7,00,000	7,00,000	
4. Two fixed deposits Receipts Nos. 3013 and 3014, dated the 19th December 1933 for Rs. 1,00,000 each repayable at 7 days' notice bearing interest at 3% below the bank rate subject to a minimum of ½%.	2,00,000	2,00,000	2,00,000	

IV.—Particulars of closing balance :—

	Rs. a. p.		Rs. a. p.
1. Cash in hand with the Secretary of the Council.	5,00,064 14 3*	Actual cash	18 1 9
		Service Stamps	46 12 6
2. Cash in current account with the Imperial Bank of India, Simla.	21,215 10 11	Cheques received from the Accountant General, Central Revenues on 29th March 1934	5,00,000 0 0
Total	5,21,280 9 2	Total	5,00,064 14 3

CHARAN DAS, *Secretary,*
Imperial Council of Agricultural Research.

I have examined the above accounts and according to the best of my information as a result of a test audit of the Books of the Imperial Council of Agricultural Research and a consideration of explanations given to me the accounts are correct subject to the remarks made in my Report of even date.

R. AGGARWALA,—
Examiner,
Outside Audit Department.

NEW DELHI;
Dated the 23rd June 1934.

APPENDIX XIV (*cf.* page 62,)

List of Schemes sanctioned during 1933-34.

(A) Schemes sanctioned by the Governing Body at a meeting held in November, 1934.

	Rs.
1. Burma Shell Oil Storage and Distributing Company for continuing experiments by tractors during 1933-34	7,000
2. Grant for statistical studies relating to Agricultural work in India to Professor P. C. Mahalanobis .	40,000
3. Extension of the research work on the effect of ions on the growth of plants by Dr. S. S. Bhatnagar	900
4. Extension of the research work on 'investigation on the relations of the Physico-chemical factors to the fertility of Soils by Dr. S. S. Bhatnagar.' .	2,420
5. Grant to the Government of Burma for a research into parasite to control the beetle pest of sugarcane in Burma	11,200
6. Grant to the Government of the N.-W. F. P. for sugarcane research	64,250
7. Grant to the Government of the Central Provinces for investigation into Vaccination of cattle against Rinderpest	46,700
8. Grant to the Government of the United Provinces for enquiry into production of Khandsari sugar in the United Provinces	3,000
9. Grant for conducting research in Warble Flies at the Muktesari Institute	32,400
10. Grant to the Government of Bengal for research into diseases of poultry in Bengal . . .	65,579
11. Grant to the Government of Mysore for investigation into Johne's disease among animals . .	20,400
12. Grant to Dr. G. S. Thapar, Reader in Zoology, Lucknow, for an enquiry into the Helminthiasis of cattle, sheep and goats in the United Provinces	19,790
13. Grant to the Government of Bombay for research in sheep-breeding	85,122
14. Grant to the Government of the Punjab for the installation of wheat milling and baking Laboratory at Lyallpur	22,300
15. Grant to the Government of the Punjab for investigation into the malting and brewing qualities of barleys	4,800
16. Grant to the Government of Bihar and Orissa for investigation into the malting and brewing qualities of barleys	6,000
17. Grant to the Government of the United Provinces for investigation into the malting and brewing qualities of barleys	4,650

18. Grant to the Government of the United Province for research on sunn hemp	34,266
19. Grant to the Government of Madras for research on pisciculture	47,660
20. Grant to the Government of Assam for investigation into fruit cultivation in Assam	37,424
21. Grant to the Government of Bihar and Orissa for research on the economics of irrigation from tube wells	73,680
22. Grant to the Government of Madras for investigation on oilseeds in the Madras Presidency .	57,100
23. Professor H. C. Chaudhri's scheme . . .	2,000
24. Continuance of India's contributions to—	
(1) International Institute of Agriculture, Rome	13,154
(2) Imperial Agricultural Bureaux . . .	29,167
(3) Imperial Mycological Institute, London and the Tobacco Federation of the British Empire	8,000 133
25. Grant to the Government of Bombay for poultry breeding research in Western India . . .	13,045
26. Grant for the investigation of tuberculosis and Johne's disease among animals . . .	2,00,000
27. Grant for Dr. P. E. Lander for determining the feeding values of certain food grains, oilseeds, and oil cakes for working bullocks and dairy cattle	38,570
28. Grant to the Government of Assam for cattle nutrition	69,788
29. (*i*) Value of oil cakes and oil seeds for working bullocks.	
(*ii*) Extension of laboratory facilities.	
(*iii*) Feeding value of oil cakes and concentrates to milch animals.	
(*iv*) Study of composition and nutritional value of milk of the cow, buffalo and goat . .	1,28,266
30. Financial assistance to the Oil Technological Institute	30,000
31. North-West Frontier Province Entomological survey	34,740
Total .	12,53,504

(B) Schemes sanctioned by the Governing Body in 1933-34 by circulation.

	Rs.
1. Grant for the staff and travelling allowance of the Indian Oil Seed Crushing Industry Committee .	8,000
2. Grant to the Bombay Presidency for experimental consignments of mangoes to England . .	5,100
3. Additional grant to the Government of Bihar and Orissa for the scheme of sugarcane research in Bihar and Orissa already sanctioned . .	29,388
4. Grant for the staff and travelling allowance of members of the Sugar Committee . . .	14,200
5. Grant for the Imperial Council of Agricultural Research library	6,000
6. Grant for the staff of the sub-station of Imperial Bureaux	2,700
7. Grant for the staff of the Sugar Technologist and his office and the Sugar Cable Service . .	54,300
8. Grant for the staff of the Central Locust Bureau .	1,300
9. Grant for the award of medals for improvements in Agriculture and Animal Husbandry . .	
10. Grant for meeting the deficit on account of excursions to cattle farm, Hissar and Karnal and Husbandry Wing of the Board of Agriculture and Animal Husbandry, 1933	229
11. Grant for the retention of Mr. Kartha on Rs. 215 and a clerk on Rs. 75 for one year from 11th April 1933	4,800
12. Grant for the enquiry into the supply of coconut products and coconut oil in India . . .	5,800
13. Additional grant to the Dacca University on account of apparatus in connection with the research in soils and on the nutrition of the rice plant	1,756
14. Grant for the appointment of the Marketing Expert and his staff	3,00,000
Total .	4,33,573

APPENDIX XV (*cf.* page 62).

List of Scientific and Technical Officers paid from the research grants of the Imperial Council of Agricultural Research, as on 31st August 1934.

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed. Promoted from the Department or recruited through the Public Service Commission, etc.	Remarks.
Sugar Technologist, Imperial Council of Agricultural Research, Cawnpore.					
1. Main Office. Sugar Technologist's Office	Sugar Technologist	R. C. Srivastava, Esq. B.Sc., (Allahabad), B.Sc. (Tech.) Manchester, Royal Technical College, Glasgow, and University College London.	4th July, 1930	By selection	On deputation lent by the United Provinces Government.
2. Research and Testing Station.	Engineer . .	J. P. Mukerjee, Esq., B.Sc., (Electrical and Mechanical Engineering) Benares Hindu University.	23rd December 1933.	By Public Service Commission.	
Locust Research Entomologist, Imperial Council of Agricultural Research, Karachi.					
Locust Research Scheme	Locust Research Entomologist to the Imperial Council of Agricultural Research, Karachi.	Rao Sahib Y. Ramchandra Rao, M.A., F.E.S.	13th December 1930.	On foreign service lent by the Madras Agriculture Department.	

	Assistant Locust Research Entomologist, Pasni.	Dr. K. R. Karandikar, Ph.D., F.R.E.S.	18th October 1931.	Direct appointment.
	Locust Research Assistant, Khanpur.	Mr. Keshodas Baweja, M.Sc.	12th December 1930.	On Foreign Service lent by the Punjab Agriculture College Lyallpur.
	Locust Research Assistant, Mirpurkhas.	Mr. Des Raj Bhatia, M.Sc.	2nd January 1931.	Through Public Service Commission.
	Locust Research Assistant, Pasni.	Mr. Atul Chandra Sen, M.Sc.	20th January 1931.	Through Public Service Commission.
	Locust Research Assistant, Ambagh.	Mr. S. M. Taqi Ahsan, M.Sc.	28th March 1934.	Direct Appointment.
	Locust Research Assistant, Karachi.	Mirza Ahmedali Khan .	11th January 1931.	On Foreign Service lent by the Baluchistan Administration.
Imperial Institute of Agricultural Research, Pusa.				
1. Botanical Sub-Station, Karnal.	Superintendent .	Mr. Kashi Ram (Offg.) .	12th April 1934.	By promotion from the Department.
	Assistant . .	Mr. R. B. Ekbote, L. Ag.	20th February 1933.	Through Public Service Commission.
2. Sugarcane Sub-Station, Karnal.	Assistant . .	Mr. G. V. James . .	16th April 1931	By promotion from the Deparment.

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed. Promoted from the Department or recruited through the Public Service Commission, etc.	Remarks.
3. Scheme for Research into mosaic and other diseases of Sugarcane, Pusa.	Sugarcane Mycologist.	Dr. S. V. Desai, Ph.D., D.I.C., B.Sc.	27th June 1932	Through Public Service Commission.	
	Assistant Mycologist.	Mr. L. S. Subramonium	23rd June 1933	Through Public Service Commission.	
	Research Assistant	Mr. S. A. Rafay, B.Sc.	17th October 1932.	Through Public Service Commission.	
4. Scheme for research on genetics of sugarcane at Imperial Canebreeding Station, Coimbatore.	Geneticist	Miss E. K. Janaki Ammal	26th May 1934.	Through Public Service Commission.	
MADRAS.					
Agricultural Schemes.					
1. Rice Research Station, Ganjam.	Superintendent Rice Research Station, Berhampore.	Mr. Samuel Jobitha Raj, B.A., (Zoology and Botany).	27th March 1933	Promoted from the Madras Agricultural Subordinate Service, Class I, Upper Subordinates.	

	Assistant . .	Mr. M. B. Venkatanarasinga Rao, B.A., (Mathematics and Physics) ; B.Sc. Ag., Underwent post graduate Course in plant Genetics at Pusa.	11th April 1932	Transferred from the Department.
	Assistant . .	Mr. K. B. Viswanathan, B.Sc., Ag.	1st May 1932	Transferred from the Department.
	Assistant . .	Mr. P. Somayajulu, B.Sc. Ag.	15th December 1933.	Recruited through the Madras Services Commission.
2. Research on Potatoes in the Madras Presidency.	Superintendent, Potato Research Station, Nanjanad.	Mr. V. K. Subrahmanya Mudaliyar, L. Ag.	13th June 1933	Promoted from the Madras Agricultural Subordinate Service, Class I, Upper Subordinates.
3. Sugarcane Research Station, Anakapalli.	Farm Manager, Agricultural Research Station Anakapalli.	Mr. R. Vasudeva Rao Nayudu, L. Ag., underwent post graduate course in plant genetics at Pusa.	29th April 1933	Transferred from the Department.
	Botany Assistant .	Mr. S. Ramaswami Ayyar, B.Sc., Ag.	11th May 1933	Transferred from the Department.
4. Enquiry into the cost of production of crops in the principal sugarcane and cotton tracts in the Madras Presidency.	District Agricultural Supervisor Coimbatore.	Mr. Subrahmanyam Pillai, L. Ag.	1st April 1933 .	Transferred from the Department.
	District Agricultural Supervisor, Bellary.	Mr. K. Jagannatha Rao, L. Ag.	5th June 1934 .	Transferred from the Department.
	District Agricultural Supervisor, Anakapalli.	Mr. M. Satyanarayana, B.A. (Physics and Chemistry) ; B.Sc. Ag.	5th August 1934	Transferred from the Department.

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed. Promoted from the Department or recruited through the Public Service Commission, etc.	Remarks.
MADRAS—*contd.*					
5. Dry Farming Scheme, Hagari.	Superintendent, of Agriculture.	Mr. C. Vijayaraghava Acharya, L.Ag.	14th April 1934	Promoted from Madras Agricultural Subordinate Service, Class I.—Upper Subordinates.	
	Assistant for Millets	Mr. P. Seshadri Sarma, B.Sc., Ag.	7th May 1934 .	Transferred from the Department.	
	Assistant for Millets	Mr. B. L. Narasimhamurthi, B.Sc., Ag.	7th May 1934 .	Transferred from the Department.	
	Assistant to the soil Physicist.	Mr. A. Abdul Samad, B.A., (Physics and Chemistry). B.Sc., Ag.	7th May 1934 .	Transferred from the Department.	
Animal Husbandry Scheme.					
6. Veterinary Diseases Investigation Scheme.	Veterinary Investigation Officer, Madras.	Mr. G. R. Viswanathan, G. M. V. C. Post Graduate training in the United Kingdom and post graduate course at Muktesar.	13th April 1933	Promoted from the Department.	
	Assistant . .	Mr. K. S, Gopalakrishan Ayyar, G.M.V.C.	10th November 1933.	Transferred from the Department.	

BOMBAY.

1. Investigation of diseases in live-stock and their treatment.	Veterinary Investigation Officer, Bombay Presidency.	Mr. R. N. Naik, G.B.V.C.	27th June 1932	Recruited through the Public Service Commission.
2. Rice Physiology .	Rice Research Assistant.	Mr. B. L. Desai, M.Sc. .	1st June 1932 .	Appointed by the Educational Department, Bombay.
3. Economic Enquiry into the cost of production of cotton in Sind.	District Supervisor, Economic Enquiry into the cost of production of cotton in Sind.	Mr. G. T. Nagrani, B.Ag. (Bom.)	10th March 1933.	Appointed by the Chief Agricultural Officer in Sind.
4. Sugarcane Research Scheme for Deccan, Padegaon.	Principal Agricultural Officer.	Rao Saheb B. P. Vaghoikar, L.Ag. (Bom.).	6th June 1932 .	Deputed from the Bombay Agricultural Department.
	Crop Physiologist .	Dr. R. D. Rege, M.Sc. (Bom.) Ph.D. (Lond).	6th July 1932 .	Recruited through the Board of Selection appointed by the Government of Bombay.
	Soil Physiologist .	Dr. J. K. Basu, M.Sc. (Cal.) Ph.D. (Lond).	18th June 1932 .	Recruited through the Board of Selection appointed by the Government of Bombay.
	Agricultural Overseer.	Mr. V. N. Apte, B. Ag. (Bom.)	18th December 1931.	Deputed from the Bombay Agricultural Department.
	Agricultural Overseer.	Mr. N. B. Patwardhan, B.Ag. (Bom.)	1st March 1932	Deputed from the Bombay Agricultural Department.

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed. Promoted from the Department or recruited through the Public Service Commission, etc.	Remarks.
BOMBAY—*contd.*					
	Agricultural Overseer.	Mr. P. S. Kulakarni, B.Ag. (Bom.).	15th October 1932.	Deputed from the Bombay Agricultual Department.	
	Agricultural Overseer.	Mr. P. V. Wagle M.Ag. (Bom.).	1st March 1932	Deputed from the Bombay Agricultural Department.	
	Agricultural Overseer.	Mr. B. H. Ghatikar, M.Ag. (Bom.).	6th February 1932.	Deputed from the Bombay Agricultural Department.	
	Agricultural Overseer.	Mr. S. S. Sirur, B.Ag. (Bom.)	5th August 1932.	Transferred from the scheme financed from the funds of the Indian Central Cotton Committee.	
	Agricultural Overseer.	Mr. V. D. Tagare, B.Ag. (Bom.), B.Sc. (Bom.).	13th August 1932.	Recruited by the Director of Agriculture, Bombay Presidency, Poona.	
5. The Scheme for an Economic Enquiry into the cost of production of crops in the principal sugarcane and cotton tracts of India.	Provincial Officer, Incharge Economic Enquiry, Bombay, Poona.	Mr. T. B. Power, B.Ag. (Bom.).	1st April 1933	Deputed from the Bombay Agricultural Department.	

	District Supervisor	Mr. S. T. Purandare, B.Ag. (Bom.).	3rd April 1933	Recruited by the Director of Agriculture, Bombay Presidency, Poona.
	District Supervisor	Mr. S. F. Chandrannavar, B.Ag. (Bom.).	3rd April 1933	Recruited by the Director of Agriculture, Bombay Presidency, Poona.
	District Supervisor	Mr. P. R. Patil, B.Ag. (Bom.).	3rd April 1933	Recruited by the Director of Agriculture, Bombay Presidency, Poona.
	District Supervisor	Mr. D. A. Patel, B.Ag. (Bom.).	3rd April 1933	Recruited by the Director of Agriculture, Bombay Presidency, Poona.
6. Dry Farming Research Scheme.	Chief Investigator Dry Farming Research Scheme, Sholapur.	Mr. N. V. Kanitkar, M.Ag., B.Sc.	1st October 1933.	Deputed from the Bombay Agricultural Department.
Main-centre, Sholapur.	Assistant Investigator, Dry Farming Research Scheme, Incharge Soil Section.	Dr. J.A. Daji, M.Ag., B.Sc.	1st October 1933.	Deputed from the Bombay Agricultural Department.
	Senior Assistant, Incharge, Plant Section.	Mr. R. B. Gode, M.Sc.	18th October 1933.	Transferred from the scheme financed from the funds of the Indian Central Cotton Committee.
	Superintendent, Dry Farming Research Scheme, Main centre.	Mr. G. M. Bapat, M.Ag.	1st October 1933.	Deputed from the Bombay Agricultural Department.

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed. Promoted from the Department or recruited through the Public Service Commission, etc.	Remarks.
Bombay—*concld.*					
	Senior Assistant in Plant Section.	Mr. D. H. Gokhale, M.Ag.	12th October 1933.	Recruited by the Director of Agriculture, Bombay Presidency, Poona.	
	Junior Assistant in Soil Section.	Mr. Y. S. Rane, B.Ag.	1st October 1933.	Recruited by the Director of Agriculture, Bombay Presidency, Poona.	
Sub-centre at Bijapur.	Superintendent, Dry Farming Research Scheme, Sub-centre, Bijapur.	Mr. K. D. Gomaste, B.Ag.	1st October 1933.	Deputed from the Bombay Agricultural Department.	
	Junior Assistant at Bijapur.	Mr. G. B. Badami, B.Ag.	2nd October 1933.	Recruited by the Director of Agriculture, Bombay Presidency, Poona.	
7. The Cold Storage Research Scheme.	Senior Research Assistant.	Dr. D. V. Karmarkar, M. Sc. (Bom.), Ph.D. (Bristol), A.I.I.Sc.	1st March 1934	Recruited by the Director of Agriculture, Bombay Presidency, Poona.	
	Junior Research Assistant.	Mr. B. M. Joshi, M.Sc. (Bom.).	1st March 1934	Deputed from the Bombay Agricultural Department.	
	Senior Mechanic	Mr. C. L. Barve, B.E. (Mech.).	1st March 1934	Recruited by the Director of Agriculture, Bombay Presidency, Poona.	

1. Rice Research Scheme	Rice Research Officer.	Babu Suresh Chandra Chakravarty, B. Sc., L.Ag.	1st June 1932 .	Promoted from Department.
	Rice Research Officer.	Babu Kshitis Chandra Banerjee, B. A., L. Ag.	1st June 1932 .	Promoted from Department.
	Assistant . .	Babu Jnan Ranjan Pal, B. Ag.	1st June 1932 .	Recruited by the Department.
	Assistant . .	Mr. E. A. R. Banerjee, M.Sc.	9th December 1932.	Recruited by the Department.
2. Animal Nutrition Scheme.	Physiological Chemist	Babu Indu Bhusan Chatterjee, L.Ag.	2nd January 1932.	Promoted from the Department.
	Assistant Chemist .	Mr. Md. Adbul Hai, M.Sc.	2nd January 1932.	Recruited by the Department.
3. Scheme for Physical and Chemical Research into soils.	Physical Assistant .	Babu Manindra Nath Chakladar, M.Sc.	1st June 1932 .	Recruited through Public Service Commission.
4. Scheme for establishing sugarcane seedling testing station in Bengal.	Field Assistant .	Moulvi Waizuddin Ahmed, L.Ag.	13th November 1931.	Promoted from the Department.
5. Horticultural Scheme in Bengal.	Horticultural Officer	Mr. V. N. Vadhawkar, B. Ag.	9th April 1934	Recruited through Public Service Commission.
6. Scheme for economic enquiry into the cost of production of crops of the principal sugarcane and cotton tracts in India.	District Supervisor.	Babu Pabitra Mohan Sen, L.Ag.	11th September 1933.	Promoted from the Department.
	Investigator . .	Babu Santi Priya Bose, B.Sc. (Edin.).	11th September 1933.	....

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed. Promoted from the Department or recruited through the Public Service Commission, etc.	Remarks.
BENGAL—*contd.*					
7. Scheme for the appointment of a Veterinary Investigation Officer in Bengal.	Veterinary Investigation Officer.	Mr. M. B. Menon, G.B.V.C.	15th December 1932.	Recruited by the Imperial Council of Agricultural Research.	
UNITED PROVINCES.					
1. Rice Research Scheme at Nagina.	Assistant Paddy Specialist.	Dr. B. L. Sethi, M.Sc., Ph.D. (Aberystwyth).	13th April 1932	Recruited through a Selection Board.	
	Farm Superintendent.	Mr. B. Gopal Saran, L.Ag.	1st April 1932 .	Promoted from the Department.	
	Research Assistant.	Mr. T. R. Mehta, B.Sc., (Pusa trained).	1st March 1932	Direct appointment.	
	Research Assistant.	Mr. Sultan Singh, L.Ag., B. Sc. Reading.	15th July 1933	Promoted from the Department.	
2. Scheme for an economic enquiry into the cost of cultivation of crops in the principal sugarcane and cotton tracts in India.	Supervisor . .	B. Tiryugi Prasad, M.A. .	1st April 1933 .	Direct appointment.	
	Supervisor . .	B. Budhi Prakash, M.A. .	1st May 1933 .	Direct appointment.	
	Supervisor . .	B. Kedar Singh, Member, Subordinate Agricultural Service.	13th March 1934	Promoted from the Department.	

3. Research into the development of the fruit industry in the hills in the United Povinces.	Soil Chemist . .	Dr. R. S. Gupta, M.Sc., Ph.D., A.I.C.	10th July 1934	Recruited through the Public Service Commission.
	Horticulturist .	Mr. R. S. Singh, B.Sc. (Reading), L.Ag.	10th July 1934.	Recruited through the Public Service Commission.
	Mycologist . .	Mr. Udai Bhan Singh, M.Sc.	10th July 1934	Recruited through the Public Service Commission.
	Entomologist .	Mr. Ram Narain Singh, L.Ag.	10th July 1934	Recruited through the Public Service Commision.
	Assistant Entomologist.	Mr. G. D. Bhat, B.Ag., F.R.A.S.	10th July 1934	Direct appointment.
4. Investigation into the problem of the sugar industry in the United Provinces.	Cane Physiologist .	Dr. R. N. Mathur, M.Sc., Ph.D. (London).	15th January 1934.	Direct appointment.
	Chemical Assistant.	Mr. Khazan Singh, B.Sc. (Agri.), M.Sc.	15th January 1934.	Promoted from the Department.
	Research Assistant .	Mr. D. C. Agarwal, L.Ag. (Post graduate training, Pusa).	15th January 1934.	Promoted from the Department.
	Entomologist .	Mr. B. D. Gupta, M.Sc. .	15th January 1934.	Direct appointment.
5. Dr. A. E. Slater's scheme of improvement of goats.	Assistant . .	Mr. B. Sardar Singh Bhatia, I.D.D.	15th October 1931.	Appointed by Dr. Slater.

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed. Promoted from the Department or through the Public Service Commission, etc	Remarks.
6. Appointment of Veterinary Investigation Officer in United Provinces.	Veterinary Investigation Officer.	Mr. Harsh Bahadur Shahi, M.Sc., M.R.C.V.S., D.T.V.M.	4th April 1933	Direct appointment.	Was a state Veterinary Scholar of the United Provinces Government in the United Kingdom prior to the appointment as Veterinary Investigation Officer.
HARCOURT BUTLER TECHNOLOGICAL INSTITUTE, CAWNPORE.					
1. Grant to Harcourt Butler Technological Institute, United Provinces for the provision of an experimental sugar plant.	Lecturer in Sugar Technology.	Mr. Abdul Rahim Khan, Dip. in Sugar Manufacture, R.T.C. (Glasgow).	23rd May 1928.	Appointed by the Department.	The Imperial Council of Agricultural Research gives a grant of Rs. 20,000 per annum for the maintenance of the Sugar Factory. The pay of the staff is met from the budget of United Province Government.
	Assistant Research Chemist.	Dr. H. D. Sen, M. Sc., Ph. D. (London).	16th January 1922.	Appointed by the Department.	
	Assistant Research Chemist.	*Mr. H.S. Chaturvedi, B.Sc., Dip. holder of H.B.T.I.	23rd May 1925.	Appointed by the Department.	*Mr. H. S. Chaturvedi is on Study leave.
	Temporary Assistant in the Sugar Factory.	Mr. K. C. Joshi, B.Sc., Dip. holder of H.B.T.I.	7th March 1933	Appointed by the Department.	

	Officiating Workshop Superintendent.	Mr. Dhanpal Chandra, Dip. Mech. & Elec. Engg. (Roorkee), Dip. Mech. Engg. and Specialised in Cotton Spinning (Roorkee) and in Cotton Spinning (City and Guilds London Institute).	15th August 1913.	Appointed by the Department.	The Workshop Superintendent looks after the engineering work of both the sections.
2. Grant to Harcourt Butler Technological Institute, United Provinces to maintain and run the Oil Section.	Head of the Oil Chemistry Section.	Mr. J. A. H. Duke . .	30th October 1922.	Appointed by the Department.	The grant to the Oil Section of th Institute a Rs. 30,000 for 1934-35 to maintain and run the Oil Section. The deficit of pay of the staff and other contingent charges are met from the budget of United Provinces Government.
	Lecturer in Oil Technology.	Mr. D. Y. Athawale, M.Sc.	24th September 1924.	Appointed by the Department.	
	Assistant Research Chemist.	Dr. N. G. Chatterjee, D.Sc., D.I.C., A.I.C., A.M.I. Chem. E., LL.B.	15th March 1921	Appointed by the Department.	
PUNJAB.					
1. Sugarcane Research Scheme.	Agricultural Assistant, A Class.	Bh. Balwant Singh Buttar, B.Sc. (Agri.).	24th January 1934.	Appointed by the Director of Agriculture, Punjab.	
	Agricultural Assistant, A Class.	Bh. Atam Singh Kochhar, B.Sc. (Agri.).	1st February 1934.	Appointed by the Director of Agriculture, Punjab.	
	Agricultural Assistant, A Class.	Bh. Dalbir Singh, B.Sc. (Agri.).	1st February 1934.	Appointed by the Director of Agriculture, Punjab.	

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed. Promoted from the Department or recruited through the Public Service Commission, etc.	Remarks.
	Agricultural Assistant, A Class.	Bh. Sardul Singh, B.Sc. (Agri.).	1st Fabruary 1934.	Appointed by the Director of Agriculture, Punjab.	
	Agricultural Assistant, A Class.	Mr. M. Abdul Latif, B.Sc. (Agri.).	1st August 1934.	Appointed by the Director of Agriculture, Punjab.	
2. Locust Research Scheme.	Agricultural Assistant, A Class.	Mr. C. B. Mathur . .	2nd January 1931.	Appointed by the Director of Agriculture, Punjab.	
	Agricultural Assistant, A Class.	Mr. M. Abdul Haq, B.Sc. (Agri.).	9th August 1933.	Appointed by the Director of Agriculture, Punjab.	
3. Cost of Cotton Crop Production Enquiry.	Agricultural Assistant, A Class.	Mr. M. Niaz Mohammad, B.Sc. (Agri.).	1st April 1933 .	Appointed by the Director of Agriculture, Punjab.	The scheme is partly paid by the Imperial Council of Agricultural Research and partly by the Indian Central Cotton Committee.
	Agricultural Assistant, A Class.	Bh. Gurbachan Singh, B.Sc. (Agri.).	23rd October 1933.	Appointed by the Director of Agriculture, Punjab.	
	Agricultural Assistant, A Class.	Bh. Gurcharan Singh Sohi, B.Sc. (Agri.).	1st August 1934.	Appointed by the Director of Agriculture, Punjab.	

4. Appointment of a Veterinary Investigation Officer in the Punjab.	Veterinary Investigation Officer.	Mr. S.M. Sarwar, M.R.C.V.S.	1st October 1932.	Promoted from Department.	
5. Parasitological Research to be undertaken at the Punjab Veterinary College, Lahore.	Veterinary Assistant.	L. Karam Chand, L.V.P.	16th July 1934	Direct appointment.	
BURMA.					
Rice Research Scheme	Rice Research Officer	Mr. J. W. Grant, I.A.S., M.A., B.Sc.	10th December 1932.	Promoted from the Burma Agricultural Department.	
	Assistant Rice Research Officer.	Dr. B. P. Pal, Ph.D. (Cantab.).	1st March—7th October 1933.	Direct appointment.	
	Assistant Rice Research Officer.	Mr. U Saw Shwe, B.Ag., (Bom.).	8th October 1933	Promoted from the Burma Agricultural Department.	
	Senior Agricultural Assistant.	Mr. U Thein Aung . .	6th July 1932 .	Promoted from the Burma Agricultural Department.	
BIHAR AND ORISSA.					
1. Rice Research Scheme (Sanctioned for 5 years from 20th January 1932.	Rice Specialist .	Mr. M. Mahbub Alam, M.Sc.	20th January 1932.	Deputed from the Bihar and Orissa Agricultural Department.	Assistant Economic Botanist deputed to work as Rice Specialist from 20th January 1932.
	Assistant Botanist .	Mr. A. Rashid Akhtar, M.Sc.	2nd April 1932	Appointed by Local Government.	
	Assistant Botanist .	Mr. Awadh Behari Saran, M.Sc. (Agra).	16th September 1932.	Appointed by Local Government.	

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed. Promoted from the Department or recruited through the Public Service Commission, etc.	Remarks.
	Senior Research Assistant.	Mr. P. D. Dixit, M.Sc.	1st February 1932.	Appointed by Director of Agriculture, Bihar and Orissa.	
	Senior Research Assistant.	Mr. R. A. P. Trivedi, M.Sc.	5th December 1932.	Ditto	
	Junior Research Assistant.	Mr. Anwarul Aziz Khan, B.Sc. (Agri.).	20th February 1934.	Ditto	
	Junior Research Assistant.	Mr. N. P. Chaudhury, M.Sc.	3rd January 1933.	Ditto	
2. Sugarcane Research Scheme (Sanctioned for 5 years from 18th March 1932).	Sugarcane Specialist	Mr. K. L. Khanna, B,Sc. (Agri.) (Punjab).	18th March 1932	Recruited through Public Service Commission.	
	Physiological Assistant.	Mr. P. C. Raheja, M.Sc. (Agri.) (Punjab).	17th December 1933.	Ditto	
	Chemical Assistant	Mr. S. C. Sen, M.Sc.	23rd December 1933.	Ditto	
	Botanical Assistant	Mr. Rama Rao Panje, M.A. (Madras).	2nd January 1934.	Ditto	

3. Fruit Research Scheme—(Sanctioned) for 5 years from 3rd April 1934).	Horticulturist .	Mr. K. C. Naik, B. Ag. (Bom.), M.Sc. (Bristol).	3rd April 1934.	Recruited through Public Service Commission.	
	Botanical Assistant Physiological Assistant. Biochemical Assistant.	Vacant . . . . .. Vacant . . . . .. Vacant			Not yet sanctioned.
4. Sugarcane Enquiry Scheme——(Sanctioned for 3½ years from 15th August 1933).	Supervisor . .	Babu Promode Ranjan Hansdah Acharjee, M.A., B.Sc. (Michigan).	15th August 1933.	Appointed by Director of Agriculture, Bihar and Orissa.	
	Supervisor . .	Babu Mahendra Prasad Verma, M.A. (Pat.).	16th August 1933.	Ditto	
5. Scheme for the appointment of a VeterinaryInvestigation Officer, Bihar and Orissa.	Veterinary Investigation Officer, Bihar and Orissa.	*Mr. Lakshmi Sahai, M.Sc., M.R.C.V.S.	2nd May 1932	Appointed through the Selection Board especially constituted.	*Appointed for five years.
CENTRAL PROVINCES.					
1. Investigation of animal diseases in the Province.	Veterinary Investigation Officer.	Mr. Bachan Singh, M.R.C. V.S.	20th June 1932	Recruited through the Public Service Commission.	
2. Scheme for the improvement of rice cultivation in the Central Provinces.	Biochemist . .	Dr. B. K. Mukerji, Ph.D., D.Sc.	9th September 1932.	Ditto	
	Botanist . .	Mr. B. B. Dave, L.Ag. .	1st September 1932.	Selected from the Department by the Public Service Commission.	

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed. Promoted from the Department or recruited through the Public Service Commission, etc.	Remarks.
	Assistant . .	Mr. R. G. Joglekar, B.Ag. .	18th November 1932.	Recruited locally.	
	Assistant . .	Mr. S. L. Vishnoi, B.Ag. .	23rd June 1933	Ditto	
3. Scheme for an economic enquiry into the cost of production of Cotton Crops.	Provincial Officer .	Mr. P. D. Nair, M.A., L.Ag. (Hons.), (Post Graduate, Pusa).	1st May 1933 .	Promoted from the Department.	
ASSAM.					
1. Investigation of animal diseases in Assam.	Veterinary Investigation Officer, Assam.	Pandit Gajanan Pande, M.Sc., M.R.C.V.S.	26th April 1933	Recruited through the Public Service Commission.	
2. Sugarcane Research scheme, Jorhat.	Chemical Assistant	Babu Hemendra Nath Pal, M.Sc. (Chemistry).	3rd October 1933.	Appointed by the Director of Agriculture.	
3. Deep Water Paddy Farm, Habiganj, Sylhet.	Botanical Assistant	Mr. P. C. Khongwir, Diploma of the Nagpur Agricultural College.	19th May 1934	Transferred from general cadre.	
HYDERABAD STATE.					
1. Enquiry into the cost of production of crops.	District Supervisor	Mr. V. K. Joshi, B.Ag. .	15th April 1933	Fresh appointment.	

Dry Farming Research Scheme.	Class II Officer	....	..	....	Appointment of a departmental officer has been proposed on this post and is still under consideration of Government.
	Senior Assistant	Mr. P. K. Savanur, B.Ag.	4th July 1934	Promoted from the Department.	
3. Castor Research Scheme.	Technical Assistant	....	..	....	Vacant ; under consideration.
	Technical Assistant	....	..	....	Ditto
4. Animal Husbandry matters.	Veterinary Investigation Officer.	Mr. M. R. Mahajan, M.R. C.V.S.	25th April 1932	Direct appointment.	
MYSORE STATE.					
1. Breeding of thick canes.	Senior Assistant Botanist.	Dr. L. S. Dorasami, M.Sc. (Lond.), Ph.D. (London).	1st February 1933.	By Government.	
	Junior Assistant Botanist.	Mr. M. L. Subbanna, B.Sc. (Hons).	1st February 1933.	By Government.	
2. Cost of cultivation enquiry.	District Supervisor	Mr. C. B. Krishnamurti, Certificate from the Hebbal Agricultural School, Bangalore.	1st April 1933 .	Appointed from the Department of Agriculture.	
BARODA STATE.					
Economic enquiry into the cost of production of crops in the principal sugarcane and cotton tracts.	District Supervisor	Mr. Manilal Harinarayan Jani, B.Ag., N.D.D., B.Sc. (Hons.) Edin.	1st April 1933 .	Appointed from the Department.	
CALCUTTA UNIVERSITY.					
Properties of colloid soil constituents.	Research Assistant	Mr. Ramprasad Mitra, M.Sc,	1st February 1933.	Direct appointment.	

Name of Scheme	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed. Promoted from the Department or recruited through the Public Service Commission, etc,	Remarks.
DACCA UNIVERSITY.					
Dacca University scheme of research on the mechanical analysis of lateritic soils and on the nutrition of the rice plant.	Senior Assistant .	Mr. P. K. De, M.Sc., A.I.I. Sc.	11th August 1930.	Appointed through a Selection Board.	
	Junior Assistant .	Mr. J. N. Chakravarty, M.Sc., Post Graduate Diploma, Pusa.	11th August 1930	Ditto	
	Laboratory Assistant	Mr. K. P. Ganguli, M.Sc. .	1st December 1932 to 31st December 1932.	Ditto	
	Laboratory Assistant	Mr. P. B. Bhattacharjee, M.Sc.	1st December 1933.	Ditto	
PUNJAB UNIVERSITY.					
1. Effect of ions on Plant Growth.	Chemist . .	Dr. K. G. Mathur, B.Sc. .	15th February 1931.		for the year 1933-34.
2. Relation between Physico-chemical Properties and Fertility of Soils.	Chemist . .	Mr. K. L. Bhagat, M.Sc. .	5th January 1932.		for the year 1933-34.
	Field Assistant .	Mr. Ved Prakash Chandra, M.Sc.	1st January 1934		for the year 1933-34.
3. Wither-tip Diseases of Citrus Plants.	Research Assistant	Mr. S. Dyal Singh Johar, M.Sc.	1st July, 1931 up to 30th June 1934.	Appointed directly.	

Investigations on "Cereal Rusts."	Research Assistant.	Mr. Raghubir Prasad Gupta, M.Sc. (Agra)—Botany, with special paper on parasitic Basidiomycetes (including rusts).	1st April 1933.	Direct appointment.
	Research Assistant.	Mr. A. N. Sawhney, B.Sc. (Hons. Sch.)—(Punjab) Botany. M.Sc. (Hons. Sch.)—(Punjab) Botany.	1st April 1933.	Ditto
	Research Assistant.	Mr. Shyama Lal Sharma, M.Sc. (Agra)—Botany, with special paper on parasitic Basidiomycetes (including rusts).	1st April 1933.	Ditto
	Research Assistant.	Mr. H. L. Gulati, B.Sc. (Pass)—(Punjab)—Botany, B.Sc. (Hons. Sch.) (Punjab)—Botany, M.Sc. (Hons. Sch.) (Punjab)—Botany.	1st April 1933.	Ditto
	Junior Research Assistant.	Mr. Ram Piyara Mal, B.Sc. (Ag.) (Lyallpur).	1st April 1933.	Ditto

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FOR THE YEAR 1934-35

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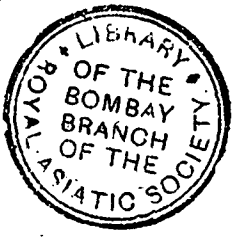

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Annual Report of the Imperial Council of Agricultural Research for the year 1934-35.

The fifth report on the working of the Imperial Council of Agricultural Research covers the period from 1st April 1934 to 31st March 1935. The tenures of the Vice-Chairman, Diwan Bahadur Sir T. Vijayaraghavacharya, K.B.E., and the Agricultural Expert, Mr. B. C. Burt, C.I.E., M.B.E., I.A.S., expired on the 14th September and 20th July 1934, respectively. Both of them were granted extensions up to 30th September 1935 and 31st March 1939, respectively. During the absence of Sir Vijayaraghavacharya in Europe on leave for a period of 2 months and 3 days, Mr. Burt was Vice-Chairman in addition to his own duties as Agricultural Expert. Mr. Burt himself was on leave for one month and 16 days from 16th April 1934 when Dr. McRae officiated in his place.

2. *Aims and Objects of the Council.*—These are set out in detail in paragraph 2 of the Memorandum of Association of the Imperial Council of Agricultural Research which has been reproduced in Appendix I of this Report.

3. *Personnel of the Council.*—A list (Appendix II) of the members of the Governing Body and Advisory Board respectively of the Imperial Council of Agricultural Research is appended to this Report.

4. *Animal Husbandry Expert.*—In view of the growing importance of the work in connection with animal husbandry and veterinary science, the Government of India were pleased to agree to the retention of the post of the Animal Husbandry Expert for a further period of five years from the 18th April 1935. The term of Colonel Olver was extended for a period of 3 years and 4 months from that date.

5. *Secretary.*—There were important changes in the personnel of the Secretary during the year. Rai Bahadur Malik Charan Das took four months' leave with effect from the 16th March 1935 preparatory to retirement. Mr. Bazlul Karim, a Superintendent, officiated as Secretary since the departure of Rai Bahadur Malik Charan Das. The Government of India have now appointed a member of the Indian Civil Service as Secretary and Mr. N. C. Mehta took over charge of his duties on the 12th August 1935.

6. *Indian States.*—The activities of the Imperial Council of Agricultural Research have attracted attention from the Indian States and enquiries have been received from some of

the important States as to the terms of admission to the Imperial Council of Agricultural Research. The accession of the States should increase the utility of the work of the Imperial Council of Agricultural Research.

Representation was granted as follows :—

Bhopal.	Travancore.
Governing Body—	
Revenue Member, Bhopal State Council	Dewan of Travancore.
Advisory Board—	
1. Director of Agriculture, Bhopal.	Director of Agriculture and Fisheries, Travancore. (There is no separate Veterinary Department in the State).
2. Revenue Secretary, Bhopal.	

7. *Meetings of the Council.*—The Governing Body and the Advisory Board of the Council met once and twice, respectively, during the year under report. The annual general meeting of the Council was held on the 19th February 1935 at which the annual report of the Council and the annual report on the accounts of the Council for the year 1933-34 were presented and adopted.

A meeting of the Crops and Soils Wing of the Board of Agriculture and Animal Husbandry was held in Delhi from the 25th February to the 2nd March 1935.

The meetings of the Council held in February 1935 afforded an opportunity to the members to be present at the laying of the Foundation Stone of the Imperial Institute of Agricultural Research at New Delhi by His Excellency the Viceroy on the 19th February 1935.

8. *Finance.*—The Government of India were pleased to make the following grants to the Imperial Council of Agricultural Research during the year :—

	Rs.
(*i*) Supplementary Grant in lieu of the Annual Research Grant which has been suspended . .	5,00,000
(*ii*) Grant for sugar research work	2,50,000
(*iii*) Special grant to enable the Council to make good earthquake damage at the sugarcane research station at Mushari, Bihar and Orissa . .	33,000
(*iv*) Grant for marketing expenditure on provincial portion of the marketing scheme . . .	33,000

Government further agreed to grant a sum of Rs. 4,16,000 for the establishment of a Central Dairy Institute. The money will be available as soon as the estimates of the scheme are finally settled.

9. *Ottawa Trade Agreement.*—The Council continued to watch the working and utilisation of the preferences on the commodities mentioned in paragraph 6 of the report for 1933-34. It is of interest to note that, from April 1935, His Majesty's Government have imposed a specific duty of $\frac{2}{3}d.$ per lb. on paddy of non-Empire origin imported into the United Kingdom. This takes the place of the previous duty of 10 per cent. *ad valorem* and is the correct equivalent of the duty of 1*d.* per lb. on whole cleaned rice of non-Empire origin, imposed as a result of the Ottawa agreement. This change was made in order to prevent the preference on Indian (and Burmese) Rice being discounted by imports of foreign paddy into the United Kingdom. Such imports of non-Empire paddy into the United Kingdom had increased to a marked degree during 1934. Another change in the United Kingdom import duties, *viz.*, the removal of *Soy* beans from the general free list and the imposing of the general duty of 10 per cent. *ad valorem* on *Soy* beans of non-Empire origin should definitely enhance the value of the preference which Indian groundnuts enjoy in the United Kingdom markets. *Soy* beans constitute a most important competitor of groundnuts and the United Kingdom supplies are drawn almost entirely from non-Empire sources. The Council continued to issue weekly circulars regarding the production, trade and market condition of linseed in India and abroad. Linseed exports to the United Kingdom during 1934-35 again reached a high level though below the record of 1933-34 when the greater part of the exportable surplus from two crops was shipped.

10. *Tobacco.*—As stated in paragraph 7 of the previous report a representative committee was appointed to consider all matters relating to tobacco cultivation and research. The personnel of the Committee will be found in Appendix III. This Committee met in September 1934, in conjunction with the meetings of the Advisory Board and a statement is appended (Appendix IV) showing the various subjects considered by it, the recommendations made and the action so far taken on each.

As recommended by the Committee, the Council has recently made grants to the local Governments and States concerned for the provision of flue-curing barns in connection

with a co-operative scheme of experiments, to be carried out in consultation with the Director, Imperial Institute of Agricultural Research, the general object of which is to ascertain in what areas the cultivation of cigarette tobacco could be extended.

A scheme for a central Tobacco Sub-Station at Guntur, has since been sanctioned by the Governing Body and it is hoped that the Council will be able to allot the necessary funds during the year 1936-37.

11. *An Outline of the Council's Activities on Animal Health and Husbandry.*—During the year under review the Council continued its endeavours to stimulate research in various branches of animal husbandry; and the main features of the work done are stated below :—

(I) *Animal Diseases*: (a) *Veterinary Investigation Officers in the Provinces.*—The expert Committee of the Advisory Board of the Council considered the annual reports of all the Veterinary Investigation Officers and was unanimously of the opinion that the scheme was producing a great deal of valuable information as to diseases of stock throughout India and made the following recommendations with a view to improve and co-ordinate the results achieved by individual workers in the different provinces :—

1. The annual reports of Veterinary Investigation Officers would be of great value to other workers and they should be circulated to all provinces and research institutions as early as possible.
2. Maps of the provinces should be published along with the reports.
3. Every item of investigation undertaken during the year should be dealt with in sufficient detail to enable the conclusions arrived at to be criticised by other workers.
4. All the yearly reports should deal with the year ending on March 31st and should be submitted by June 1st.
5. The Veterinary Investigation Officers should be permitted to visit the Imperial Institute of Veterinary Research, Muktesar, for about ten days every year to discuss problems arising out of the work under investigation in their provinces and also to give them an opportunity to obtain the latest information as to the results of the research in progress at the Institute.

In this connection the Director, Imperial Institute of Veterinary Research, Muktesar, has since pointed out that it would be impossible to accommodate all Veterinary Investigation Officers at Muktesar at the same time and suggested that it would be better for them to be detailed individually for refresher courses for longer periods, at least once in the course of their term of employment when arrangements could be made for their accommodation. While adopting the report of the Committee the Advisory Board further recommended that the staff of the Imperial Institute of Veterinary Research, Muktesar, should be strengthened. This recommendation has been communicated to the Government of India.

(b) *Further investigation into vaccination of cattle against rinderpest in the Central Provinces.*—This scheme which was approved by the Governing Body in November 1933 was sanctioned in August 1934. The questions to be studied are—

(1) The best method of obtaining virus. Should goat virus first be used or would local virus from an actual outbreak give better results?

(2) How should the virus be distributed in the field?

(3) By what method of feeding or by what adjuncts to the ordinary diet during various seasons of the year can the loss of flesh so commonly found after vaccination be prevented?

(4) What is the number of passages through goats required for safe and yet efficient vaccination in the various breeds?

(5) How can the recrudescence of piroplasmosis and coccidiosis after vaccination be controlled?

(6) Under what conditions can vaccination be undertaken during actual outbreaks?

(c) *Investigation of Johne's disease among cattle in Mysore.* This is another scheme to which financial sanction was conveyed during the year under report. The lines of research proposed are :—

(1) Epidemiological survey of the disease in Mysore State commencing with Bangalore and Mysore cities.

(2) Preparation and investigation of avian tuberculin and Johnin for testing and comparing the results with complement fixation and other serological tests.

(3) Extension of work on the chemotherapy of Johne's disease using Ol. Chaulmoogra and its derivatives.

On the recommendation of the Advisory Board, the Council has financed the scheme subject to the condition that intensive work on item 3 of the programme of work is carried on and that only such work will be attempted on item 2 as can be done within the duration of the experiment and with the resources available.

(d) *All-India Legislation.*—The action taken by the Council to promote measures for the prevention and control of animal diseases by means of suitable All-India legislation was carried a stage further during the year. The draft Bill and model rules which had been under the consideration of the Government of India were circulated to Local Governments and Minor Administrations for their views.

(II) *Animal Nutrition.*—The Government of Madras applied in 1931 for a grant of Rs. 49,930 for the extension of the work on Animal Nutrition in Madras. The Agricultural Department of that Province had already been carrying on work (*a*) on the determination of the digestive co-efficients of working bullocks for commonly used roughages and concentrates of South India and of the requirements of bullocks of different breeds and on different levels of work; (*b*) on mineral metabolism of cattle; (*c*) manuring as affecting the nutritive value of crop; and (*d*) the applicability of results obtained with small animals to big animals. The lines on which the work is proposed to be extended are—

(i) A more intensive study of the mineral metabolism of cattle.

(ii) More intensive studies on the effect of manuring on the composition of food-stuffs and fodders and their nutritive values.

(iii) Extension of the studies on the applicability of results with small animals to big animals.

(iv) Studies in the nutrition of milch cattle including buffaloes, the main lines of investigation being on the subject of comparative values of rations for milk, suitable rations for cows in calf and calf rearing.

(v) Sheep feeding for wool and mutton.

(vi) Poultry; value of Indian feeds.

(vii) Pastures; nutritive value of pastures.

(viii) Silage, deep, shallow and clamp silage.

This is the second of the series of animal nutrition schemes to be sanctioned by the Council, the first being the one from Bengal for the appointment of a Physiological Chemist to study animal nutrition problems at Dacca mentioned in last year's report.

(III) *Animal Industry*: (a) *Goat Breeding*.—Mention was made in the last report of a scheme of research in goat-breeding submitted by the Mission Poultry Farm, Etah. During the year 1934-35 the Governing Body of the Council considered the annual reports of the scheme for the years 1932-33 and 1933-34 (second and third reports). The remarks of the Cattle Breeding Committee and the Advisory Board of the Council which considered the reports in question are given below :—

1932-33 Report—

(i) The work is being carried on satisfactory lines and is already leading to valuable results. The importance of controlling *Brucella* infection was emphasised and it was considered that an adequate isolation ward was essential.

(ii) From the figures produced in the report the Committee formed the opinion that some of the goats had been kept in milk for unduly long periods and suggested that an effort should be made to determine the optimum length of the lactation period in each of the breeds dealt with and to milk their goats accordingly.

1933-34 Report—

(i) It was suggested that the cost of production of milk should be made available in future reports and also the extent of the mortality amongst the young stock.

(ii) It was also suggested that tests at short intervals should be made to make sure that the herd was free from infection of contagious abortion.

The above remarks were communicated to Mr. A. E. Slater, who is in charge of the scheme, for necessary action.

(b) *Sheep Breeding.*—Mention was made in the last report, of the sheep-breeding policy recommended by a special committee in August 1933. In accordance with that recommendation a scheme was received from the Government of Madras for a grant of Rs. 37,580 for sheep breeding research in that Province, and approved by the Governing Body at its meeting held in January 1935. The Council has so far approved two sheep breeding schemes, *viz.*, the Bombay and Madras schemes, but it has not hitherto been possible to allot the necessary funds to either of these schemes.

(c) *Dairying.*—The Provincial Economic Conference 1934, recommended that the Imperial Institute of Animal Husbandry and Dairying at Bangalore should be supplemented by the provision of a model creamery with facilities for industrial research, and additions to the existing Dairy Institute including more land and laboratory facilities for carrying out research on the physical and chemical properties of Indian milk and its reactions to the various forms of processing and transport under Indian conditions. As a result of this recommendation a scheme has been prepared with a view to expand the existing Imperial Institute of Animal Husbandry and Dairying at Bangalore and to establish an experimental creamery at Anand, Gujarat, Bombay Presidency. The Government of India have, for this purpose, sanctioned a sum of Rs. 6 lakhs for a period of five years. The position will thereafter be re-surveyed with a view to decide whether the activities of the institute should be continued in the extended form.

(d) *Animal Husbandry Bureau.*—As has already been mentioned in last year's report the Bureau was started in 1934 with a nucleus staff consisting of a Statistical Assistant and a clerk. The main functions of the Bureau are :—the collection, collation and dissemination of information required for the proper development of Animal Husbandry in India, and to institute an All-India system of registration of Pedigree Stock based on the official definition of their breed characteristics, and of officially controlled milk-recording in the case of dairy cattle. The work of the Bureau is at present

seriously handicapped by the absence of a suitable organisation in Provinces and States for the collection of such information, and by the lack of data regarding livestock and livestock products, similar to those published in other countries, especially those relating to trade statistics. A great deal of valuable spade-work has, however, been done during the year to show the economic importance of developing Animal Husbandry in India on the lines followed in all progressive Livestock countries.

The next step will be to develop the statistical side of Animal Husbandry by building up an organisation in India for the systematic collection and publication of trade statistics and other information necessary for the proper development of animal Industry. The work done during the year may be summarised as under :-

1. Collection, collation and publication, in four papers dealing with information obtained from Military and other Government Dairies, of data regarding the economic efficiency of different types of cattle.

2. Similar data were collected regarding Goats and a paper prepared for publication.

3. Data were collected regarding accessory factors in milk production, cost of production of milk in privately owned dairies and from buffaloes maintained by *Gwálás* in towns and villages, potentialities of Indian dairy cattle for dairying, advantages of weaning, etc., and the cost of production of milk from goats.

4. Material was collected for drawing up a case for protection of the butter industry in India.

5. Standard forms were drawn up for the systematic recording of milk and pedigrees of cattle, and circulated for trial and criticism. Steps were taken for the collection of information regarding characteristics of different breeds of cattle in India with a view to bringing out a brochure on the subject as a preliminary step for the establishment of herd books.

6. Notes were prepared showing the incidence of Foot-and-Mouth disease and Contagious Abortion in

cattle with preliminary estimates of loss due to these diseases and their effects.

7. Numerous enquiries were dealt with including a number from foreign countries.

(IV) *Medicinal plants.*—In 1932 the Government of Bengal forwarded a scheme submitted by Lt. Col. R. N. Chopra of the School of Tropical Medicine, Calcutta, for research in the systematic cultivation of medicinal plants and study of food poisons in India. This scheme was recommended by the Advisory Board in 1932 and was approved by the Governing Body in October 1932, but due to lack of funds the scheme could not be sanctioned earlier than this year. The lines of research proposed in this scheme are—

(1) To make a general survey of the medicinal plants which are natives of India and of those which have been naturalised.

(2) To get in touch with the Agricultural Departments and Institutions in different provinces and encourage them to grow suitable medicinal plants.

(3) To analyse the medicinal plants so produced in order to see if their active principles come up to the standard required by the pharmacopoeias. In this way it will be possible to determine in what part of the country particular drugs do best.

(4) To test pharmacologically and therapeutically the action of these drugs.

(5) To carry out a systematic investigation of different food and forage poisons occurring in the country.

Another scheme of the same category approved and financed by the Council during the year under report is the scheme submitted by the Government of Mysore for investigation of Indian Fish Poisons and other Indian Forest products for their insecticidal properties. The lines of research proposed in this scheme are—

(1) To ascertain and collect through local agencies the plants that are commonly used as fish poisons; to have detailed information as regards their distribution, availability and methods of use.

(2) To conduct preliminary tests to ascertain the insecticidal properties of these plants.

(3) To extract the active agent of the plant.

(4) To test the insecticidal properties of the extract as obtained by various methods and to make comparisons with a view to ascertain which method is the most successful producing the least change in the process of extraction.

(5) To test the residues to see whether any of the active agents is left over unextracted.

(6) To ascertain by actual tests the least expensive and the most successful method, and to fix the strength to be used against various pests.

(V) *Work of the Standing Animal Husbandry Committees.*—(1) *Cattle Breeding Committee.*—This Committee met twice, once in September 1934 and again in February 1935, and considered among other things the following important subjects :—

(i) Complaint regarding excessive dirt and impurities in East Indian Wool imported into England.

(ii) Complaint regarding excessive slaughter of lambs and kids for their pelts during recent years.

The recommendations of the Committee on these two subjects are being followed up and the action taken by the Council will be reported in the next year's report.

(2) *Animal Nutrition Committee.*—This Committee also met twice during the year, namely, September 1934 and February 1935, and the most important subject they discussed was the establishment of a Central Animal Nutrition Institute for all-India. The Committee made concrete suggestions for the establishment of such an Institute which were considered and accepted by the Advisory Board at its meeting held in February 1935 and further action is being taken accordingly.

(3) *Dairy Committee.*—The committee met in February 1935 to discuss the steps necessary to promote the development of the indigenous butter industry.

(4) *The special committee appointed for the purpose of considering the necessity for a more thorough inspection of milk and dairies in cities and rural areas* and legislation for the prevention of adulteration of dairy products met in March

1934. The Committee recommended that in order to obtain first-hand information requisite for a detailed examination of the question of legislation on milk and other dairy products sub-committees should visit representative places and obtain the necessary information. Accordingly four sub-committees were appointed and have submitted their reports, which were still under consideration.

The Council takes this opportunity of thanking the official and non-official members of these committees for the valuable help rendered by them in visiting various centres at considerable inconvenience to themselves and in obtaining a great deal of valuable information.

12. *Research Schemes—Agricultural—*

(*i*) *Rice research.*—The plan and scope of this important group of research schemes has been stated in previous reports. Important and successful research work on rice had been in progress in several of the rice-growing provinces, notably in Madras, Bengal and Burma for many years previously. The Council's grants have been applied to the filling of lacunæ in existing research arrangements, the study of problems which had been neglected and to securing a greater measure of collaboration between research workers in different parts of India, the interchange of information and of material. Progress reports for 1933-34 on the work done at the rice research stations in receipt of grants from the Council were received from all provinces except Bihar and Orissa. These were examined by a special sub-committee of the Advisory Board which found the reports to be generally satisfactory but made a number of suggestions for carrying out field experiments and in breeding work. The report from Burma was considered to be very well presented and the Sub-Committee recommended it as a model for all rice research reports. Among the more general recommendations made by the Sub-Committee the following may be mentioned :—

(*a*) that there should be greater uniformity in the use of such terms as 'variety', 'strain', 'pure line', etc. After consulting the Imperial Bureau of Plant Genetics it was decided that the word 'variety' should be used for commercial and agricultural varieties, that the term 'strain' should be reserved for strains multiplied at a plant breeding station from single-plant cultures, that

the term 'pure line' should be restricted to strains which have been demonstrated to be pure lines in the strict botanical sense (these pure lines being fully described under type numbers) and that the term 'single plant culture' is a suitable description for such cultures whilst still under study;

(*b*) that in connection with the marketing surveys each research station would undertake to test samples of rice from that province for hulling percentage, fineness of grain and if possible breakage and similar grain characters, and that the marketing officers should visit the various research stations;

(*c*) that facilities would be given to rice research officers to visit other rice research stations.

The Sub-Committee recommended that in *Madras* the experiments on the manuring of paddy seed-beds should be continued as such manuring had given satisfactory results in Burma and the Central Provinces. It was noted that the Berhampore Experimental Station will eventually be situated in the new province of Orissa; this possibility had been allowed for, in framing the programme of work at the station; it is also expected that by the end of the five-year period for which the scheme was sanctioned some improved varieties will be ready for distribution. A number of suggestions were made for improvements in the lay-out of experiments and the statistical interpretation of results. In Burma new strains were found to match the *Carolina* types of rice now imported into Europe. These were grown on a considerable scale and the cultivators obtained a premium of 20 per cent. from exporters for their paddy on account of the superior quality. The more important of the new crosses under study in Burma included an attempt to match the well known *Blue Rose*—a 'bold' type of American rice which has a shorter grain than the *Carolina* types and which mills better. The object of these experiments is to obtain a type suitable for the United Kingdom and also for the continent of Europe where Burma has lost a considerable portion of its rice export trade owing to competition from America, Spain and Italy.

Work at the two Rice Research farms in Western Bengal (Bankura and Chinsura) was mainly devoted to the production of pure types of the finer rices, *e.g.*, *patnahi* and to experiments on improved methods of cultivation and manuring. At the United Provinces Rice Research Station at Nagina, work

was continued on crosses between various good quality rice and the early-maturing enclosed grain type, *Sathi* which escapes the ravages of the Rice Bug. The immediate object of this station is the production of a more economic type of good quality rice for the important Sarda canal tract.

In the Central Provinces satisfactory progress was made at the Labhanahi rice research station in Raipur district on a number of problems. A study of the rice soils of the Central Provinces yielded valuable results and this was expanded during 1934-35. Progress was also made in rice-breeding and cultivation experiments.

A special feature of the work at the rice research stations is the lay-out of field trials in a manner to permit the interpretation of the results by modern statistical methods and on a uniform plan so far as the varying conditions permit. A good deal of valuable information on the general question of the best lay-out for different types of field experiments in India is thus being gained.

(*ii*) *Rice physiology.*—The progress report on the scheme of rice physiology by Prof. R. H. Dastur, for the year 1933-34 was considered during the year by a special sub-committee of the Advisory Board of the Council. The Sub-Committee drew attention to the fact that one direct practical result, *viz.*, the superiority as a fertiliser of a mixture of ammonium sulphate and sodium nitrate to either constituent on some soils, has emerged from a purely physiological investigation. It was suggested that agricultural departments might find it worth while to test this conclusion over a wider range of conditions. This scheme of work has since been completed and the results are being published in the Indian Journal of Agricultural Science.

(*iii*) *Botanical Sub-Station, Karnal.*—The work at this station has continued satisfactorily and the report on the progress made, up to the 30th June 1934, was considered and adopted by the Advisory Board. In view of the useful work which has been done at the Sub-Station, its continuance for a further period of five years from October 1935 has recently been sanctioned. The Sub-Station will continue at Karnal until the new Imperial Institute of Agricultural Research actually begins to function at Delhi and thereafter a sub-station will be maintained at Pusa on the existing Botanical Section which fortunately was not seriously damaged by the earthquake of

1934. As the objects for which the Sub-Station was established at Karnal will be fulfilled by the Botanical Section of the new Institute, a Sub-Station at Pusa is required for North-East India.

(*iv*) *Potato breeding.*—At Nanjnad in the Madras Presidency potato breeding research has been continued. The report for 1933-34 was a preliminary one but the report for 1934-35 shows that progress is being made and that Nanjnad is likely to be a successful breeding station and that a reasonable range of varieties can be used as parents.

The question of potato research in Northern India and of a breeding station or stations in the Himalayas, was very thoroughly examined by a special sub-committee of the Advisory Board in February 1934. The committee made the following recommendations :—

(*a*) the most important problems of potato growing in Northern India could be studied at a single central research station co-operating with provincial testing stations and that the question of the most suitable locality should be examined in detail;

(*b*) that the recent work in Russia and elsewhere had shown the great value in plant breeding work of certain Central and South American forms of *S. tuberosum*, and more particularly of several other species of *Solanum*. Consequently any plant breeding scheme for potatoes should include the study of as many new forms as possible;

(*c*) that the possibility of an expedition to South and Central America, preferably in co-operation with the other parts of the Empire, should be investigated;

(*d*) the Deputy Director, Imperial Bureau of Plant Genetics, Cambridge, should be requested to ascertain what suitable phytophthora-resistant varieties and other suitable new material could be obtained from various research institutions in Europe and America;

(*e*) an effort should be made to obtain phytophthora-resistant types and hybrids from Russia in exchange for seed, etc., supplied from India.

It was considered that potato-breeding research should be undertaken by the Imperial Institute of Agricultural Research and that the second Economic Botanist who had experience of such work should specialise in it. The Director, Imperial Institute of Agricultural Research, prepared a scheme of work which included work on the plains at Pusa and work at a Hill breeding station in the Himalayas at the altitude of 7,000 to 8,000 feet and work was started at Pusa in October 1934 and arrangements were made for preliminary investigations in the hills during the summer of 1935. In order to ascertain the best site for the hill station preliminary co-operative experiments are now in progress at the following hill stations :—

United Provinces.—Chaubattia and Ramgarh.

Punjab.—Kulu Valley, Murree Hills.

Assam.—Shillong.

Facilities for these trials were provided by the Agricultural Departments concerned and a grant of Rs. 500 to each has been made to meet special expenses. Meanwhile work on potato breeding is being carried out at Simla in the grounds of the Rust Research Laboratory. A number of South and Central American forms and hybrids have been obtained through the kindness of :—

(1) The Institute of Plant Industry of the Lenin Academy of Agricultural Sciences, Department of New Cultures and Introduction (Dr. Sharapof);

(2) Prof. Donald Reddick of Cornell University;

(3) Dr. Schick (of the late Prof. Baur's laboratory) (through Dr. Hudson, Imperial Bureau of Plant Genetics, Cambridge);

(4) Prof. Salaman (Potato Virus Research Station, Cambridge);

(5) The U. S. A. Department of Agriculture.

These are under study.

The recommendation regarding an expedition to South and Central America has been referred to the Executive Council of the Imperial Agricultural Bureaux for advice.

(*v*) *Agricultural meteorology.*—The second annual progress report on the work done under this scheme during the year ending 21st August 1934, was considered by a special sub-committee of the Advisory Board which reported that good work had been done which is of practical value to agriculture and which should be continued. Most importance is attached

to the work on micro-climatology which really amounts to the accurate measurement and precise expression of the ecological factors which are so important to plant growth and pest control. Such work is also of importance to an understanding of the conditions which determine the infection of plants by diseases, of immediate practical application is the system of frost-warnings recently devised. A note explaining the present position of knowledge in this respect will be found at appendix V. After reviewing the progress made the Advisory Board recommended, and Governing Body decided, that the Branch should be continued for the full period of its original sanction, *i.e.*, until August 1937 and that the question of its further continuance should be considered in consultation with the Departments of the Government of India concerned. Meantime some necessary additional staff and equipment was sanctioned.

(*vi*) *Investigations on cereal rusts.*—The report for the year 1933-34 on the scheme of investigations by Dr. K. C. Mehta of the Agra University on the rusts of wheat and barley showed that very satisfactory work had been done. The special Sub-Committee which examined the progress made upto the end of 1933-34 reported that there was now sufficient knowledge of the physiologic forms of the three rusts to enable breeding work for the production of resistant varieties to be started with a reasonable prospect of success. Moreover, evidence is accumulating that the indigenous Himalayan *Barberry* is comparatively immune to black rust and probably plays a minor part in the maintenance of black rust of wheat in India. This doubtless explains the relatively small number of physiologic forms recorded and improves the prospects of producing resistant varieties. Future work was planned accordingly.

In view of the very valuable results which have been achieved during the five years' work on the problem, the Council has sanctioned an extension of the scheme for a further period of three years from April 1935. The programme of work during this period of extension includes :—

(*a*) the study of the physiologic forms of all the three rusts of wheat including the examination of a larger number of specimens from all the wheat-growing tracts of India.

(*b*) an intensive study of the possible role of indigenous species of *berberis* and *thalictrum* in the life histories of black and brown rusts respectively.

(*c*) the further testing on popular Indian wheats from each province the pathogenicity of pure cultures of the four known physiologic forms of black rust and two known forms of brown rust and of any which may be discovered later. Fifty-two Indian wheats were tested in 1933-34.

(*d*) Location of the *foci* of infection in the hilly areas in different parts of the country and the study of the incidence of the rusts on the plains in the neighbourhood. Very useful information on this important aspect of the problem has been obtained during the last three years and it is necessary that this study should be completed.

(*e*) the study of rust dissemination, with the help of aeroscope slides will be continued.

(*f*) a place-to-place survey of over-summering of rusts and their incidence on crops will be carried out in the Punjab, Bombay, Deccan and Madras, with the co-operation of the provincial Departments of Agriculture concerned.

The scheme also provides for research on the breeding of rust-resistant wheat at Simla, in collaboration with the Botanical Section of the Imperial Institute of Agricultural Research Land and laboratory facilities are available at the Rust Research Laboratory and have been placed at the disposal of the Imperial Economic Botanist. A special assistant has also been provided by the Council. The immediate breeding programme includes :—

(*a*) The production of crosses between important economic types and resistant forms especially with *Khapli* wheat and a subsequent study of the progeny with the object of selecting those segregates which combine rust-resistance with desirable agricultural and economic characters.

(*b*) The further testing of indigenous varieties for resistance to definite physiologic strains of the three rusts.

(*vii*) *Virus diseases of plants.*—Reference was made in a previous report to the deputation of Dr. B. N. Uppal to Europe and America for the study of the present position of research on virus diseases of plants and of the most modern technique. His report on his deputation was approved by the Council and

also certain modifications in the scheme of work which he proposed as a result of his enlarged experience. This comparatively obscure group of plant diseases causes considerable economic loss in India and it is the intention to proceed with the main scheme of work as soon as the finances of the Council permit.

(*viii*) *Fruit research.*—The object of the group of research schemes has been stated in previous reports. As work was only started about the beginning of 1934-35, no progress reports on the work done have yet been reviewed by the Advisory Board except that on the Bombay Cold Storage scheme. The technical programme for that scheme was approved by the Advisory Board during 1934 and included experiments with mangoes from various provinces and Nagpur *santra* oranges. The report on the 1934 experiments with mangoes showed that the Bombay *Alphonso* and Madras *Peter* mangoes possessed a good commercial storage life and ripened well at low temperatures. Several other varieties were unsatisfactory and others are being tested. The influence of temperature on wastage and on the rate of ripening of mangoes stored at four stages of maturity was also determined. Considerable progress was also made with the study of the chemical changes which occur in mangoes stored at different temperatures. Detailed reports on the experimental shipments of mangoes from Bombay to London during the 1933 season, for which funds were provided by the Council, were received from the Government of Bombay and the Empire Marketing Board during 1934-35. In view of the very limited cold storage facilities between Bombay and London available at present and as there seemed to be no prospect of getting precise information as to the temperature and humidity conditions under which the fruit travelled it was decided to suspend experimental shipments at least until the Poona experiments had yielded accurate technical data regarding the optimum conditions of storage and transport.

(*ix*) *Dry farming.*—The object of this group of investigations is to devise improved methods of soil management and to breed and introduce drought-resistant strains of important crops in order that crop production in regions of scanty and precarious rainfall may be less of a gamble than at present. Satisfactory progress was made at the Madras (Hagari), Bombay (Sholapur) and Hyderabad (Raichur) Experiment Stations. These stations are working on an agreed programme laid down by a co-ordinating sub-committee and

quarterly reports are exchanged. The Punjab Dry Farming Experiment Station has been located at the Rohtak experimental farm where work was started very recently.

(*x*) *Dacca University scheme for research on the mechanical analysis of lateritic soils and the nutrition of the rice plant.*—Satisfactory progress has been made with the scheme which has been extended until July 1938. A further test on 18 lateritic soils from different parts of India confirmed the value of the 'alkaline permanganate' method of dispersion referred to in last year's report. The method is now being tested on a variety of soils in different parts of India by several agricultural chemists. Further progress was made with the biochemical study of the paddy soils of Bengal and the results are in course of publication in the Indian Journal of Agricultural Science.

(*xi*) *Research into properties of colloid soil constituents. (Chemical Department, University College of Science, Calcutta University).*—Prof. Mukherjee's work on soil colloids was referred to at some length in last year's report and has been continued on the lines there indicated. In its comments on the progress report the Soil Science Committee emphasised that first class work had been done and considerable difficulties overcome and the research grant has been renewed for a period of three years from October 1935 in view of the fact that these investigations are of great benefit to agricultural research workers in the various branches of soil science.

(*xii*) *Preparation of cheap synthetic manure from town refuse and waste materials.*—Work on this investigation was started at the Indian Institute of Science, Bangalore during the year on the programme outlined in last year's report.

(*xiii*) *Quality in crops*—(a) *Rice.*—Work on this scheme which is being carried out by the Professor of Bio-chemistry at the Indian Institute of Science, Bangalore, jointly with the Madras Paddy Specialist, Coimbatore, was started during the year. The effect of storage and parboiling on the nutritive value of rice and the relative food values of different improved strains are under study. The paddy specialist has also undertaken a study of the cooking quality of rice in connection with the marketing survey of the Madras rices.

(b) *Barley*.—The reports on the malting and brewing tests and valuations of the experimental barleys shipped during 1933-34 from Sabour (Bihar and Orissa), Cawnpore (United Provinces), and Lyallpur (Punjab), have been received from the Institute of Brewing in London. The Bihar barleys (20 types) were shipped in duplicate from Calcutta and Karachi in view of possible differences due to the longer and more humid voyage from Calcutta. There was little practical difference between the two sets of samples in 1934. Several of the Bihar barleys were reported to be really promising types.

From Cawnpore (United Provinces) 10 types of improved six-row barleys were sent. With the exception of one type, all the United Provinces barleys were found to be of very good quality and it was reported that they would malt easily and brew well, and have good prospects in the United Kingdom market.

From Lyallpur (Punjab) six samples were despatched and although these did not compare favourably with the other Indian barleys in appearance, they were found to be good malting material and to make good brewing material. Further tests are being made in 1935 on samples from the 1934-35 crop in order to determine which types should be selected for distribution.

(*xiv*) *Investigations on the chemistry of malting cholam.* —As stated in last year's report, the object of this scheme is to complete the research work started by the Agricultural Chemist, Madras, on the utilisation of *Cholam* (*Sorghum Vulgare* —or *juar*) in the preparation of malt foods.

Sanction for this scheme was communicated in October 1934 and work has commenced from April 1935. The full technical programme given below has recently been approved :—

(1) *Technical programme of work for three years 1935-36 to 1937-38.*

(i) *Bio-chemical*—

(*a*) Detailed investigations of the chemical processes which *cholam* undergoes during the malting process with reference to changes in carbohydrates, fat and proteins.

(*b*) Study of the optimum conditions of temperature, etc., for malting on laboratory and industrial scale.

(*c*) A more detailed study of the enzymes involved in the process of malting and of methods of controlling their activity.

(*d*) Study of the fat content of *cholam*—this being known to affect the keeping quality of the malted meal.

(ii) *Technical: Packing, Grading and Marketing of cholam foods.*

(iii) *Nutritional*—

(*a*) Nutrition value of *cholam* malt foods.

(*b*) Utilization of malting bye-products in cattle breeding.

(*c*) Digestibility of malt meals.

13. *Cost of production of crops in India.*—(*i*) The second year of the enquiry into the cost of production of crops in principal sugarcane and cotton growing areas financed jointly by the Imperial Council of Agricultural Research and the Indian Central Cotton Committee was completed and the work done in most of the provinces and States concerned between April 1st and June 31st 1935. The Joint Sub-Committee considered at its third meeting in September 1934 the data accumulated as a result of the first year's working after they had been checked at the headquarters. The Committee decided to send the data back to the provinces for further checking and verification, and sanctioned Rs. 100 per annum per district to meet the extra cost of clerical assistance.

(*ii*) The corrected data for the first year are now being received from the various provinces and States and compiled at the headquarters. These, together with the results of the second year's working, will be put before the next meeting of the Joint Sub-Committee.

(*iii*) The question of cutting down the original period of enquiry by a year as a measure of economy was discussed but turned down by the Joint Sub-Committee at its fourth meeting in February 1935 and it was decided to carry on the enquiry for its full allotted term of $3\frac{1}{2}$ years.

(*iv*) The Chief Economist in Charge made extensive tours with a view to supervise and co-ordinate the work in the provinces.

14. *Sugar.* (I) *Sugar Committee—(a) Personnel.*—In accordance with the recommendation of the Advisory Board that members of standing committees appointed under rule 30 of the Rules and Regulations of the Council should not hold office for more than two years at a time, the Sugar Committee was re-constituted during the year. The present personnel of the Committee will be found in Appendix VI. Dr. J. H. Haldane was appointed as a member of the Committee, *vice* Mr. Noel Deerr, as a representative of the Indian Sugar Producers Association as Mr. Deerr had left India on long leave.

(*b*) *Meeting.*—The Sugar Committee met at Simla in July 1935. At this meeting the Committee examined progress reports on ten research schemes financed by the Council.

Two schemes for improving the quality of the sugar, produced in small open-pan factories were not recommended by the Committee since they overlapped the schemes already in progress.

The Committee recommended for sanction the continuation of (*i*) the Karnal Sugarcane Sub-Station; (*ii*) the Sugarcane Seedling Testing Station at Dacca and (*iii*) the scheme for the study of sugarcane seedlings at Shahjahanpur.

Two new schemes, (*i*) for research on the insect pests of sugarcane, and (*ii*) for an investigation in the Baroda State of suitable types of canes for Gujerat were approved by the Committee at an estimated cost of about Rs. 1,49,366 and Rs. 11,300 respectively spread over a period of five years. The Committee also approved of the action taken by the Vice-Chairman of the Council in sanctioning the starting of the Bureau of Sugar Standards under the Sugar Technologist, a reference to which is made elsewhere in this report.

The committee noted with appreciation the progress made in sugar research but considered that more intensive work was required in several directions, more especially in those connected with the improvement of the quality of the raw material, the raising of the standard of sugarcane cultivation, the combating of diseases and pests, the dissemination of information concerning improved methods, adequate demonstration and the more rapid multiplication and introduction

of new seedling canes of proved value and their supply to cultivators. The committee also emphasised the fact that the continuance and development of the research schemes on sugarcane breeding, sugarcane physiology, sugarcane pathology, and sugarcane cultivation at present financed by the Government of India through the Imperial Council of Agricultural Research and adequate research on the utilization of byeproducts were as essential as the provision for technological research at the Central Sugar Research Institute.

The Committee considered further the question of the disposal of surplus molasses and recommended that all outlets, both industrial and agricultural, should be investigated and desired the Research Council to earmark a specific sum from the sugar research grant for the purpose of carrying out such experiments. A scheme of experimental work in the preparation of molasses cattle foods (from molasses and *bagasse*, molasses and *bhusa*, etc.) and for feeding tests at Bangalore and in the various provinces has since been approved by the Governing Body.

The Committee also considered the reference made to it by the Crop Planning Conference (1934) regarding future extensions of sugarcane cultivation in India. It was decided that in the absence of reliable data regarding the yield of cane per acre, the committee could not make any definite recommendation regarding the area which should be cropped annually with sugarcane. It was recommended that Provincial Governments should be asked to re-institute crop-cutting experiments on sugarcane and also to have the areas under plant and ratoon cane separately recorded and reported. These recommendations have since been accepted by the Advisory Board.

(II) *Grant for sugar research.*—The Government of India made a grant of Rs. $2\frac{1}{2}$ lakhs for financing existing schemes of sugar research during the year 1935-36.

(III) *Progress reports—Sugar schemes*—(1) *Production of new seedling canes for Northern India.*—(*a*) *Shahjahanpur.* The scheme of sending large batches of young cane seedling, of known and selected parentage to the Shahjahanpur experimental farm in order that selection might be carried out under local conditions was continued. Two further progress reports on the work done have been received, which show that promising results have been obtained. A preliminary selection of seedlings found suitable at Shahjahanpur has been made and these have been designated CoS canes with a view to avoid

confusion. They are being multiplied and critically examined for both field and laboratory characters. With the establishment of a sugarcane research sub-station at Muzaffarnagar, it is now possible to test CoS canes, which have already undergone preliminary trial for two years in Shahjahanpur, for their suitability to the Western Districts of the United Provinces.

The Council has since sanctioned the continuance of these experiments, for a period of 5 years.

(*b*) *Karnal Sugarcane Sub-Station.*—As explained in previous reports the object of providing the Imperial Sugarcane Expert with this branch establishment is to speed up the production and testing of seedling canes for North-Western India. Crosses made at Coimbatore have been raised as complete families at Karnal and selection has been made locally. In addition the behaviour of a number of Co varieties has been studied in greater detail than hitherto. Results of practical value have been obtained and on the recommendation of the Sugar Committee the Council has approved the continuance of the scheme for a further period of five years from March 1936.

(2) *United Provinces Sugarcane Research Scheme.*—Under this scheme the farm at Muzaffarnagar was converted into a second research station, to deal with the problems of cane cultivation in the western part of the United Provinces and the adjoining areas. The programme includes a study of insect pests to which certain Coimbatore canes there appear to be particularly liable. A study will also be made of the physiology of the cane plant at Shahjahanpur with special reference to the factors on which the effective growth depends.

(3) *Bihar and Orissa Sugarcane Research Scheme.*—The progress report for the year 1933-34 on the work at the Mushari Research Station was examined in detail by the Sugar Committee which concluded that work of considerable value was being done. A number of recommendations were made with a view to ensure that the programme was not too ambitious.

(4) *Sugarcane Seedling Testing Station at Dacca.*—The progress report of this scheme for the year 1933-34 was examined by the Sugar Committee and considered satisfactory. A standard form of report for tests on seedling canes was prepared by the Imperial Sugarcane Expert and, on the recommendation of the Sugar Committee supported by the Advisory Board. All sugarcane testing stations receiving

grants from the Council have been requested to adopt this form.

(5) *Assam Sugarcane Research Scheme.*—The first annual report on the work done under this scheme during 1933-34 was of a preliminary nature and called for no comment.

(6) *Madras Sugarcane Research Scheme.*—The first progress report on the work done at the Anakapalle Research Station covering the period 1933-34, was examined by the Sugar Committee who found that satisfactory progress had been made. The Committee recommended several changes in the details of the experimental programme and in regard to the statistical interpretation of the experimental data.

(7) *Bombay-Deccan Sugarcane Research Scheme.*—The second progress report on the work of the Padegaon Sugarcane Research Station for the year 1933-34, was examined by the Sugar Committee. Satisfactory progress has been made with the study of the cane soils of the Deccan and their behaviour under irrigation and the question of maintaining fertility. The relation of manuring to water supply, the most suitable irrigation rotations and the manurial requirements of cane under Deccan conditions have also been studied and the factors determining the quality and keeping qualities of *gur*.

(8) *Mosaic and other diseases of sugarcane at the Imperial Institute of Agricultural Research, Pusa.*—The progress report on this scheme for the year 1933-34 shows that good work has been done, especially in the direction of ascertaining the nature of the causative organism. The Sugar Committee after examining the report has drawn attention to the importance of the susceptibility to mosaic of certain fodder crops, *e.g.*, elephant grass, which has been referred to in the report. Dr. Desai's results have been published *in extenso* in the Indian Journal of Agricultural Science.

(iv) *Sugar Technologist and the Sugar Cable Service*—

(*i*) *Industrial and technical.*—The expansion of the sugar industry in India consequent on the grant of protection in 1932 continued at a rapid pace and 27 factories, including one small experimental factory, were added in 1932-33; 65 in 1933-34, making a total of 123 factories, of which 112 were reported to have actually worked during the season 1933-34. Of the remaining 11, seven were not ready in time, 3 failed to submit the returns and one is a small experimental factory with a nominal and uncertain output for training students.

The United Provinces had the largest number of the new factories. No less than 27 new factories began operation in the United Provinces in 1933-34, 14 in Bihar and Orissa, 5 in the Punjab, 2 each in Bengal and Madras, 4 in Bombay and one in an Indian State. The total number of cane factories reported to have worked during the season 1934-35 is 138. The year was particularly unfavourable to the *gur*-refining section of the industry as *gur* prices were higher and sugar prices lower than in the preceding year. Only 8 out of the 50 cane factories equipped for refining *gur* and 8 out of 30 refineries, worked during the year as compared with 27 in the preceding year.

The services of the Sugar Technologist were in demand for a variety of purposes, in connection with suitable sites for new factories, specifications of machinery, scrutiny of tenders and advice of a technical nature. He inspected a number of sugar factories and made extensive tours in the discharge of these duties. The following table illustrates the varied nature of his activities :—

1. Number of persons advised regarding sites, etc. .	115
(*i*) Specifications and schemes drawn up and tenders scrutinized	30
(*ii*) Technical advice dealing with erection, starting up and extension (including sites) . . .	85
2. Number of factories advised during operation regarding efficiency of working	47
3. Number of replies regarding technical education in India and abroad	34
4. Number of replies to general technical enquiries (excluding the above)	315
5. Number of sugar factories helped in recruiting their technical staff	24

(*ii*) *Sugar Section of the Harcourt Butler Technological Institute.*—The following laboratory work was undertaken in the Sugar Section of the Institute of which the Sugar Technologist is the honorary Head :—

1. Complete analysis of molasses from carbonatation and sulphitation cane factories and *gur* refineries.
2. Elimination of lime from factory molasses.
3. Experimental work on the standardisation of sugars
4. Treatment of cane factory effluents.

(*iii*) *Research and testing station for the indigenous systems of gur and Sugar Manufacture.*—During the year under report plans, estimates and specifications of various buildings for the Research Station were drawn up and a site at Bilari (District Moradabad, U. P.) was finally selected. Arrangements for the supply of electricity were made with the Hydro-electric Branch of the United Provinces Irrigation Department, and an agreement entered into for the supply of cane and disposal of finished products.

(*iv*) *Bureau of Sugar Standards.*—The Bureau was started under the Sugar Technologist for the provision of standards for the grading of Indian-made sugars and it is hoped to issue the standard sets shortly. A small museum containing samples of various sugars and *gur* made in this country is also maintained.

(*v*) *Statistical.*—The Statistical Section of the Sugar Bureau collected and distributed statistics relating to the production, consumption, imports and exports of sugar for India and the principal sugar-producing and consuming countries of the world. A large number of requests for information were received, both from the public and from Government departments. As in previous years, the Director-General, Commercial Intelligence and Statistics, Calcutta, was furnished with weekly quotations for edible *gur* in the important markets of India, first cost quotations for Java White Sugar, the highest and lowest prices of typical Indian factory sugars, and figures for stocks of sugar at the major Indian ports. Brief reviews of the cane crop conditions in different parts of the world were compiled for incorporation in the all-India sugarcane forecasts published each year in August, October and February. Brief notes on monthly exports of sugar from Java were also supplied for publication in the Indian Trade Journal, in which was also published the annual Review of the Sugar Industry in India for 1933-34. As the sugar industry of India has now expanded sufficiently to supply the major portion of the quantity required for home consumption, accurate forecasts as to the output of sugar have become a matter of increasing importance. It was accordingly decided to collect statistics and compile forecasts of the production of sugar from cane for the season 1934-35. Two forecasts, called the "first" and "final" forecasts of sugar production in India were published in the Indian Trade Journal.

The Sugar Cable Service and Sugar Postal Service continued to obtain and distribute to members early and reliable crop and market reports regarding sugar in the principal countries of the world. The Indian Sugar Trade Information Service continued to collect and distribute among subscribers daily quotations and weekly reports of sugar for important Indian sugar markets. These quotations were utilized by the Directors of Industries of two provinces, *viz.*, Bihar and Orissa and the United Provinces, for the fixation of minimum cane prices in these provinces.

(*vi*) *Training in Sugar Technology.*—During the year 1934-35 the number of students from other provinces admitted on the nomination of the Imperial Council of Agricultural Research to the three sugar courses at the Harcourt Butler Technological Institute, Cawnpore, was as follows:—

	I. C. A. R. nominees.	Students from the United Provinces.
Sugar diploma course	10	20
Sugar Analysts course	5	5
Sugar Boilers course	8	8
Total .	23	33

Of these, four came from Bihar, four from Madras, three from the Punjab, three from Bengal, two from the Central Provinces, two from Bombay, two from the United Provinces and one each from Delhi, Assam and an Indian State. The number of students from the United Provinces has been shown for comparison.

(*vii*) *Employment Bureau.*—The Employment Bureau maintained by the Sugar Technologist continued to maintain a list of qualified persons which was supplied to the sugar factories requiring technical staff. The Bureau assisted a number of successful students of the Sugar Technology courses to secure suitable employment.

(*viii*) *Publications and Library.*—Sixteen notes giving detailed statistical information were published in the "Indian Trade Journal" and two in "Agriculture and Livestock in India". An Article was contributed to the "Indian State Railways Magazine" for June 1934 on "The growth of the White Sugar Industry of India". The Sectional Library was freely used by persons interested in the sugar industry. 141 volumes were added to the Library during the year.

(V) *Minimum prices for sugarcane.* A reference was made in paragraph 21 of the previous report to the passing in April 1934 of the Sugarcane Act which empowers the Local Governments to fix minimum prices for sugarcane intended for factories, to prohibit the purchase of cane except from the grower or from a licensed cane-purchasing agent and to make rules regarding weighments and other matters. The Act is of an enabling character and it is left to the Provincial Governments to apply the Act to the whole or any part of a province as they may think fit. The Act is now in operation in the whole of the United Provinces and in North Bihar (Districts of Saran, Champaran Darbhanga, Muzaffarpur and Purnea; also those parts of the Bhagalpur and Monghyr Districts which lie north of the Ganges), *i.e.*, in areas which include approximately 96 factories out of a total of 142 for the year. In both the provinces the minimum price is fixed on a sliding scale. A basic price of five annas per maund of cane corresponds to an average price of Rs. 8-8-0 for No. 1 sugar ex-factory whilst each rise or fall of eight annas in the price of sugar means a rise or fall of one-quarter anna in the minimum price of cane. For *khandsari* factories a lower sliding scale with a basic minimum price of three and a half annas was prescribed.

The Sugarcane Act also enables rules to be framed for the organisation of sugarcane growers into societies for the sale of cane to factories. Recognising the need for the better organisation of cane supply, the Government of India have undertaken to set aside annually a sum equal to one anna per cwt. of the sugar which pays excise for distribution to sugarcane growing provinces for expenditure on approved schemes for the better organisation of cane supplies. Several proposals by local Governments for the utilisation of their share of this grant, have been approved by the Government of India.

15. *Soil Science—*

(*i*) *Soil Science Committee.*—The Soil Science Committee met in conjunction with the meetings of the Advisory Board held in September 1934. The Committee examined (i) the progress report on the scheme of research on the mechanical analysis of lateritic soils and on the nutrition of the rice plant at the Dacca University including proposals for the extension of the scheme and (ii) the progress report for 1933-34 on the scheme for research into the properties of colloid soil constituents by Professor J. N. Mukherjee of the Calcutta University.

(*ii*) *Third International Congress of Soil Science.*—As stated in the previous report the Council undertook to meet the cost of one delegate from India to the Third International Soil Science Congress to be held in Oxford in July-August 1935. The Indian Society of Soil Science elected Dr. J. N. Mukherjee, Kaira professor of Chemistry at the University of Calcutta, the first secretary and now a Vice-President of the Society, as the Indian national representative. Professor Mukherjee was appointed leader of the Indian delegation to this Congress. The other delegates who attended the Congress were :—Professor S. P. Agharkar, Mr. D. N. Wadia, Mr. M. Carbery, Mr. D. V. Bal and Dr. A. T. Sen.

(*iii*) *The Indian Society of Soil Science.*—This society was formerly started at Calcutta, during the annual meeting of the science Congress in January. A further meeting was held at Delhi in February in conjunction with the meeting of the Board of Agriculture.

16. *Statistical Section.*—The Statistical Section of the Imperial Council of Agricultural Research comprises, besides Mr. Vaidyanathan (the Statistician); a Statistical Assistant, an Agricultural Assistant and a clerk. Mr. Vaidyanathan's principal duty is to assist agricultural officers in the provinces and constituent States in the planning of new experiments with a view to ensure the greatest possible accuracy and to help them in the statistical analysis and interpretation of their experimental results and the large amount of useful data which in the course of time, have been collected in various parts of India in connection with various agricultural activities. The Statistician's services have been freely called upon by the various Provincial Departments of Agriculture, the Imperial Institute of Agricultural Research, the Indian Tea Association, the Departments of Agriculture in Baroda and Hyderabad and others. In a good many instances the Statistician visited the various farms in connection with references to his Section which numbered 124 during the year.

In addition to giving advice on the lay-out of agricultural experiments and statistical interpretation of accumulated data the Statistical Section has been helpful in preparing useful statistics and graphs required for the Crop Planning Conference and the Wheat Conference convened by the Government of India during the past year. Mr. Vaidyanathan has also compiled a set of statistical tables which have been referred to Dr. R. A. Fisher, the well-known authority on agricultural

statistics for comments. The work of the Statistician has been appreciated and Mr. Vaidyanathan was decorated with the title of Rao Bahadur during the year.

17. *Locusts.*

(1) *Locust movements.*—During the year under report, two reports of locust flights were received by the Locust Bureau of the Research Council. One swarm (presumed to be desert locusts) was said to have appeared on the 20th July 1934 in the Puranpur Tahsil of the Pilibhit District, United Provinces, entering the tahsil from the east and passing on without alighting. The report was not accompanied by specimens, and the Entomologist to Government, United Provinces, was unable to confirm it. In the second instance a few swarms were reported to have visited the northern part of the Malakand Agency in September 1934, and the species concerned is presumed to have been the Moroccan Locust (*Dociostaurus maroccanus*), which is known to have been active of recent years in parts of Afghanistan north of the Hindukush.

(2) *Locust survey work and observations of the permanent or semi-permanent breeding grounds.*—Survey work was continued on much the same lines as in the previous year, the staff being distributed in three different circles, each under the control of an assistant: *viz.*, (1) *the Khanpur Circle*, for the northern desert areas of India, (2) *the Mirpurkhas Circle*, for the southern desert areas, and (3) *the Mekran Circle*, for the desert areas of Mekran and Lasbela. In all of these areas the desert locust still persisted in small numbers in the solitary phase. The staff visited all important localities in each circle periodically, so as to note the effect of seasonal conditions on the habits and activities of the locust and on the fluctuation in its numbers.

In addition, two new desert out-posts were opened during the year, (1) at Chachro in the Thar-Parkar District, and (2) at Sardarshahr in the Bikaner State, for studying the general meteorological conditions of the desert and for intensive observations on the breeding and activities of the locust in the areas immediately surrounding these centres.

A substantial amount of information has been gathered in regard to the breeding habits of locusts of the non-gregarious type and their general response to changes in the seasonal conditions, but the data collected are insufficient to permit of definite conclusions.

(3) *Ecological studies.*—Studies on the ecology of the desert locust were continued at Pasni and Ambagh in South Baluchistan.

Meteorological observations of a simple character taken at the desert out-posts at Chachro and Sardarshahr have served to give more definite information regarding the general climatology of the Indian desert region for purposes of comparison with the coastal *reks* of Mekran and other similar breeding grounds of the locust in other countries.

During the year 1934, there was a failure of the winter rains in the Mekran *rek* areas, and it was noted that, doubtless in consequence of the drought, no breeding of the locust occurred in nature, though the initial locust population was fairly large at the beginning of the season. Nor was there any summer breeding, as there was no rainfall during the summer months. The population consequently diminished greatly, and towards the end of the year, very few locusts were found during surveys on the *reks* near Pasni and Gwadar. With the fall of plentiful rains in December, 1934, however, locusts began to reappear in small numbers, and fairly extensive breeding has taken place during the spring of 1935.

In the summer-rainfall areas of Lasbela and the deserts of Sind and Rajputana, rains commenced rather early both in the Lasbela coastal areas and in parts of the Indian Desert, but as the monsoon retreated rather earlier than usual, the multiplication of locusts was apparently limited to a single generation.

With the commencement of the dry cold weather in November 1934, it was found that locusts began to disappear in the desert areas,—especially in the neighbourhood of Chachro,—and were not, in general, noticeable throughout the winter and spring months.

(4) *Study of old records.*—During the year, the large mass of information on locust occurrences available in the season and crop reports for Sind, published in the Sind Official Gazette since 1872, was extracted and compiled, and the data studied in detail. Data of rainfall for Sind and the adjacent provinces for various years were also collected as far as available for correlation with the records of locust abundance in particular years. It was evident that during years of locust activity the plains of Sind have been the scene of occurrence of two distinct sets of locust movements in each year: *viz.*, one occurring during the pre-monsoon months of April, May and

June, when sudden incursions of locust swarms, coming from a westerly direction, were noticeable, first in the towns near the western border, later on further to the east and last of all in the desert areas of the Thar-Parkar District; the other, in the autumn months—from September onwards,—when large swarms of pink locusts, coming from the desert areas of Sind and Rajputana further east, caused much damage to crops in general and gradually moved westwards towards Baluchistan.

During the last 65 years, there appear to have been, in Sind and neighbouring regions four distinct locust cycles *viz.*, 1869 to 1881; 1888 to 1907; 1912 to 1919, and 1926 to 1931, the intervals between these periods being years of locust disappearance.

Data on locusts have also been collected from the season and crop reports published in the Bombay Government Gazette. These relate to the areas included in the Bombay Presidency proper for the years from 1869 onwards, and are being studied. The compilation of the data on locust movements collected from various sources has now been completed, and the mapping has been begun.

(5) *Third International Locust Conference.*—The Third International Conference met in London in the second week of September in response to the invitations issued by the British Government to countries interested in Locust research and control. Thirteen countries were represented by 50 delegates and advisers. Rao Sahib Ramchandra Rao, Locust Research Entomologist, attended the Conference as the Indian delegate. The various resolutions adopted by the Conference related to different aspects of Locust Research, and aimed at securing a still greater degree of international collaboration in what is essentially an international problem. The discussions which took place, embodying as they did the experience of workers in many countries, were of great value in bringing about a clarification of ideas in regard to many important points, especially 'locust breeding grounds', the direction of migrations, the influence of meteorological conditions the best methods for field surveys, and the control of flying swarms by aeroplanes.

(6) *Summary of the more important results on the ecology, etc., of the Desert Locust at Pasni and Ambagh.*—Although much information is on record on the habits and life-history of the gregarious phase of the Desert Locust, very little is known in regard to its solitary phase. Intensive work has, therefore,

been in progress at Pasni on the life-habits of the solitary phase in its natural breeding grounds. Special attention was devoted to its responses to changes in such environmental factors as temperature, humidity, strength of wind, rainfall and drought, food-plants, and natural enemies. Seasonal rainfall appears on the whole to be the most important factor in the life-economy of the locust in both of its phases. Breeding can take place only when there is rain, and in its absence, there appears to be a tendency to migrate to more favoured regions.

The central problem of the ecological studies in progress at Pasni is the elucidation of the conditions under the influence of which the solitary phase is transformed into the gregarious. So long as the locust continues to live in its non-gregarious form and is confined to its natural breeding grounds, it is of little economic significance to man. It is only when it over-multiplies under the influence of favourable conditions and forms swarms and begins to migrate to distant countries that it becomes a source of danger. Some observations made of late in the Mekran area have given definite clues as to how the change of phase may take place in nature. They suggest that on the occurrence of early and heavy winter rainfall the solitary locusts would breed and multiply in numbers on the coastal *reks*, and that, a good many of the adults of the new generation would subsequently migrate into the interior valleys of Mekran in April and May. As the places where eggs can be laid are rather limited in this area, concentrations of the locust would occur during breeding, leading to a transformation into the *transiens* or *gregaria* phase.

(7) *Results of locust survey work.*—From a study of the past records, it is evident that locust infestations in India occur in fairly definite cycles. Locusts occur in abundance during a series of years, after which they disappear for a longer or a shorter time, only to reappear later on. Locust survey work was organised in order to find out if there are within the limits of British India any permanent breeding grounds capable of giving rise to locust swarms.

During the time swarms lasted, locusts were to be found in most parts of North-West India, and were duly reported by the provincial and state revenue organisations, but as soon as the visitation subsided, locusts assumed a non-gregarious form of existence confined to the desert regions, so that their presence could not be detected without the employment of special technically trained staff. Owing to the sparseness of the locust

population, and the great extent and the comparative inaccessibility of the desert regions to be surveyed, considerable difficulty was experienced by the survey staff, but much useful information has been accumulated.

The delimitation of the areas important in regard to locust breeding has been made, and intensive survey work has been carried out in typical localities in such areas. The observations made indicate that the locust, even in its gregarious form, is entirely dependent on rainfall for oviposition and breeding, and recent experience also suggests that even the solitary form of the locust may undertake seasonal migrations covering long distances, just as the *gregaria* form does. The tentative conclusion has been reached that the "*reks*" of the Mekran coast are more important from the point of view of the origination of swarms than other parts of the Great Indian Desert, covering parts of Sind and Rajputana.

(8) *The practical value of survey work.*—The main purpose of the locust survey work has been to get definite and accurate knowledge of the movements and activities of locusts in their non-gregarious condition, and thereby to get clues as to how and whence fresh locust visitations originate.

Past experience has shown that, when a locust cycle has actually started, the infestation will extend over a series of years if the swarms are capable of reaching distant regions of rainfall at the right time and breeding there under favourable conditions. It is obviously a very difficult matter to destroy the swarms, after the migration impulse has developed, and the best way of tackling the locust problem would naturally be to nip the evil in the bud by concentrating attention on the actual outbreak centres and controlling the infestation at its source. It is, therefore, necessary to get definite knowledge as to the actual places where the transformation of phase takes place, and as to the conditions under which an outbreak would originate.

18. *Marketing of agricultural produce.*—The question of agricultural marketing was discussed at the Provincial Economic Conference held in April 1934 and there was general agreement at the Conference that, of all practicable measures for improving economic conditions, an intensive programme to develop marketing facilities for agricultural products relating both to crops and livestock offered in the existing circumstances the greatest scope for substantial results. The Conference was of opinion that the action to be taken to deal with

the main marketing problems should include propaganda and the supply of information in external markets regarding Indian products; the grading, sorting and bulking of the main staple products; special market organisation for perishable commodities; information to Indian producers of consumers' requirements both at home and abroad; the planning of production on the basis of quality and demand; the establishment and development of regulated markets; the undertaking of market surveys for the purpose of developing a common plan throughout India and the establishment of properly organised 'futures' markets, commodity exchanges and warehouses.

(2) As stated in paragraph 9 of their Resolution No. F.-16 (1)-F./34, dated the 5th May 1934, the Government of India decided to proceed on the lines recommended at the Conference which included the following initial steps:—

(1) The appointment of a Central Marketing Officer and staff by the Government of India.

(2) The appointment of Provincial Marketing Officers.

(3) The inauguration of marketing surveys.

(4) The appointment of special committees for staple crops.

(5) Work on grade standards.

These recommendations broadly follow the recommendations of the Royal Commission on Agriculture which were endorsed in general by the Central Banking Enquiry Committee.

(3) The question of establishing additional crop committees is still under Government consideration. Meanwhile it was decided to give immediate effect to the other recommendations in accordance with a scheme of work prepared by Mr. A. M. Livingstone, who had joined the Imperial Council of Agricultural Research as Marketing Expert. The work, which is being undertaken by a Central staff in conjunction with Provincial Marketing staffs, falls into three main divisions, *viz*:—

(i) Investigation work;

(ii) Development work; and

(iii) Work on grade standards;

and may be summarised as follows :—

A.—Investigation Work.

This includes a series of marketing surveys which will cover in the first year the important commodities grouped as follows :—

I. Crops.—(*a*) Cereals (wheat and rice),
(*b*) Oilseeds (groundnuts and linseed),
(*c*) Plantation and special crops (tobacco and fruit).

II. Animal Husbandry Products :—
(*a*) Dairy products, etc. (milk and eggs),
(*b*) Livestock (including hides and skins).

Certain general questions are also included within the scope of the surveys, such as, regulated markets, marketing organisation, transportation, storage and preservation of the commodities, standardisation of containers, etc.

While the work in connection with the planning of surveys, compilation of data and preparation of all-India reports is chiefly with the Central staff, the actual work connected with the execution of the surveys is being shared between the Central and Provincial Marketing staffs. The completed surveys are intended to set out in detail the existing system of marketing of the commodities concerned, not only in the provinces separately, but also in respect of inter-provincial, inter-state and foreign trade with a view to provide a general picture of the existing conditions and a common basis for future progress. It should be possible as a result of these survey reports to formulate proposals for any necessary and practicable improvements in marketing organisation and make definite recommendations regarding questions such as of grading, handling, methods of packing, conditions of transport, provision of containers.

B.—Development Work.

The programme of development work must obviously depend on the results of the marketing surveys and will have chiefly to be done in the provinces by the Provincial Marketing staff. It may, in some cases, be possible to organise small

packing stations, *e.g.*, for eggs and fruits, with a view to demonstrate the practicability of bulk sorting, grading, packing and the commercial advantages of employing the new standards.

C.—Grade Standards.

This work will be of a technical character relating to the chemical and physical characteristics of such products as oilseeds, grains, fruit, etc., and the testing of grading technique and equipment under practical conditions.

(4) As regards finance, the Government of India agreed, subject to funds being voted by the Legislative Assembly, to meet for a period of five years the expenditure on the Central staff as well as of certain staff in the Provinces. For this purpose the necessary provision would be made for the Central staff and Provincial staff separately under a new Head, *viz.*, "60—A—Scheme for the improvement of Agricultural Marketing in India" in the Budget Estimates of the Central Government. The total grant for the Provincial staff has been fixed at Rs. 2 lakhs per annum which is to be disbursed by the Imperial Council of Agricultural Research to the Provinces in the same manner as other grants for agricultural research schemes, subject to a limit prescribed for each province.

(5) The office of the Agricultural Marketing Adviser to the Government of India came into existence on January 1, 1935, as an attached office of the Imperial Council of Agricultural Research Department with the Marketing Adviser at the head, and has been permanently located at Delhi. The Central Marketing staff consists of, besides the Marketing Adviser, 18 other Marketing Officers of various grades with their respective staff, who have been allotted to commodities and groups of commodities in the manner indicated above. The Marketing Adviser, however, moves between Delhi and Simla with the Imperial Council of Agricultural Research Department and two of his Senior Marketing Officers are permitted to recess in Simla for a limited period.

(6) Provincial Governments and Minor Administrations and almost all the Indian States have agreed to co-operate in the marketing work by appointing their own separate marketing staff or by nominating some of their existing officers for the purpose. These officers will work in the closest touch with the Central Marketing staff.

(7) By the end of February 1935, all the Central Marketing Officers and the Senior Marketing Officers in most of the provinces and in some Indian States had taken up their appointments and a joint Conference was held at Delhi early in March. The Conference discussed in detail the lines on which marketing work should be conducted and settled the synopses on which the reports on marketing surveys are to be based and the questionnaires for the commodities to be investigated.

(8) At the close of the year, survey work by the local marketing staffs had just commenced in most provinces and in the larger States and the Central Staff was engaged on marketing surveys in the Delhi Province and in arranging the details of similar surveys to be started in the Indian States.

19. *Crop Planning Conference, 1934.*—The discussions at the inter-provincial Economic Conference brought out clearly the need for considering the general position of agricultural production in India as a whole. The Government of India accordingly convened a Crop Planning Conference which met at Simla on the 8th and 9th of June 1934. As a preliminary to the main conference the Imperial Council of Agricultural Research appointed an expert Sub-Committee of its Advisory Board which compiled the material and framed issues for consideration by the Conference.

20. *Standing Committees for Rice and Wheat.*—One of the recommendations of the Crop Planning Conference was that standing committees for rice and wheat should be established by the Imperial Council of Agricultural Research and financed from the Council's funds. The functions of these committees were to include the consideration of all matters relating to the production, marketing and general improvement of these two staple crops, periodical reviews of the statistical position of production and consumption (internal and external) of rice and wheat, and progress in research in connection with these two cereals. These recommendations were accepted by the Imperial Council of Agricultural Research and it was decided that two committees with the composition shown in Appendix VII should be appointed under rule 30 of the Rules and Regulations of the Council. The Government of India, local Governments, constituent Indian States, the Inter-University Board, the Associated Chambers of Commerce and the Federation of Indian Chambers of Commerce and Industry have been consulted and it is anticipated that the two committees will shortly begin their work.

21. *Board of Agriculture and Animal Husbandry in India. —Crops and Soils Wing.*—The first meeting of the crops and soils wing of the reconstituted Board of Agriculture and Animal Husbandry in India was held at Delhi on the 25th February—2nd March 1935. The agenda and resolutions passed will be found in Appendix VIII. The proceedings of the Board are in press.

22. *Third Imperial Mycological Conference.*—The Third Imperial Mycological Conference was held in London during September 1934 and India was represented by Dr. W. McRae, C.I.E., retired Director, Imperial Institute of Agricultural Research, Pusa and Dr. H. C. Chaudhuri, University Reader in Botany of the Punjab University. Both these gentlemen were in England at the time of the Conference, and the Council is indebted to them for the readiness with which they undertook this task. Among the matters on which resolutions were passed by the Conference may be mentioned a proposal for a system of uniform "health" certificates which should accompany imports of plants and plant products; (2) arrangements for the exchange of information regarding the plant protection regulations in force in the various parts of the Empire; and (3) the standardisation of insecticides and fungicides. Matters of very considerable importance to Indian agriculture were discussed and the delegates' reports have proved very valuable. These have been circulated to members of the Council.

23. *International Institute of Agriculture, Rome.*—The twelfth General Assembly of the International Institute of Agriculture, Rome, was held from the 22nd to the 27th October 1934 and India was represented thereat by Sir Bhupendra Nath Mitra, K.C.S.I., K.C.I.E., K.B.E., High Commissioner for India in London, and Mr. (now Sir Allan) Green, I.C.S. then Deputy High Commissioner for India. As in previous years the High Commissioner represented India on the Permanent Committee of the Institute. Of recent years there has been a marked increase in the utility of the publications of the Institute.

24. *Wheat Marketing.*—In July 1934, the Imperial Council of Agricultural Research offered a prize of Rs. 500 for a thesis on the following subject:—

(i) The existing mechanism, methods and any other factors which determine wheat prices in the principal *mandis* (=markets).

(ii) Whether such prices normally constitute a fair return to the grower.

(iii) The steps needed to ensure a fair return to the grower, if the answer to (ii) be in the negative.

Competitors were informed that due regard should be paid to the international wheat position, to the fact that at present India was neither a wheat-exporting nor a wheat-importing country, that there was an import duty on wheat of Rs. 2 per cwt. and that the exchange value of the rupee in terms of sterling was likely to remain as at present. Twenty essays were received. The following gentlemen kindly acted as judges :—

1. Diwan Bahadur Sir T. Vijayaraghavacharya, K.B.E.
2. Mr. D. L. Drake-Brockman, C.S.I., C.I.E., I.C.S., (Member, Board of Revenue, U. P.)
3. Dr. L. C. Jain, M.A., LL.B., Ph. D., Professor of Economics, University of the Punjab, Lahore.

Two theses were adjudicated to be of equal merit and the prize was divided equally between :—

(i) Mr. Abdul Hamid, 343, Grand Trunk Road, Lahore, and

(ii) Mr. J. M. Lobo-Prabhu, I.C.S., Dehra Dun.

Both theses have been published in "Agriculture and Livestock in India".

25 *Publications.*—The Council continued to publish the bi-monthlies "Agriculture and Livestock in India" and "Indian Journal of Agricultural Science" and the quarterly "Indian Journal of Veterinary Science and Animal Husbandry". Out of forty-two original articles published in "Agriculture and Livestock in India", twenty-seven related to soils and crops and fifteen to subjects connected with animal husbandry. The number of original articles published in the "Indian Journal of Agricultural Science" was fifty-two of which fifteen may be classed as botanical, seven as chemical, four as entomological and eighteen dealt with plant diseases. Of the twenty-five original contributions to the "Indian Journal of Veterinary Science and Animal Husbandry", seventeen related to diseases of livestock, three to animal nutrition and two to dairying.

(a) *Monographs.*—The following Scientific Monographs were published during the year :—

No. 5.—The Bombay Grasses. By the Rev. E. J. Blatter, S.J., Ph.D., F.L.S. and Mr. C. McCann, F.L.S.

No. 6.—Helminth Parasites of the Domesticated Animals in India. By Mr. G. D. Bhalerao, M.Sc.

No. 9.—Mechanical Cultivation in India : a history of large-scale experiments carried out by the Burmah-Shell Oil Storage and Distributing Company of India, Ltd. By Mr. C. P. G. Wade.

A second edition of 1,000 copies of Scientific Monograph No. 3, 'The Open Pan System of White Sugar Manufacture, 1932', by R. C. Srivastava, was published to meet the public demand.

One scientific monograph, 'Spotted Boll-worms of Cotton (*Earias fabia* Stoll and *Earias insulana* Boisd.) in South Gujerat, Bombay Presidency', by Messrs. B. P. Deshpande, M.Ag. and N. T. Nadkarny, B.Ag., was in the press at the end of the year.

(b) *Bulletins.*—Four Miscellaneous Bulletins were issued during the year, of which three were bibliographical lists of publications on Indian Entomology, and the fourth a 'Host Plant Index of Indo-Ceylonese Coccidae'. Of the three other Bulletins which were in the press at the end of the year, one was the second edition of Pusa Bulletin No. 187, 'The Production of Cigarette Tobacco by Flue Curing', by Dr. F. J. F. Shaw and Mr. Kashi Ram, the first edition of which appeared in 1929; another was the revised third edition of Pusa Bulletin No. 46 on 'Bee-keeping'; the last being the 'List of Publications on Indian Entomology, 1933'.

(c) *Supply of publications.*—Mention was made in the last report regarding the steps taken to ensure the regular supply of official agricultural and veterinary publications to officers serving in the agricultural and veterinary departments throughout the country. The scheme of reciprocal exchanges of these publications among the various departments in India,

which was commenced last year, has been continued during the year. Besides the supply of about 150 copies each of the three Journals published by the Council under this arrangement to the various agricultural and veterinary officers, copies of Council's publications were supplied to about 395 institutions borne on the Council's distribution list for regular supply. Two hundred of these are foreign scientific institutions with which exchange relations have been established. Of the 195 Indian institutions receiving copies, about 120 were supplied free of cost and the rest on exchange basis. Numerous requests were received both from India and abroad for the free supply of these journals.

Name of the Periodical	No. of copies published	No. sold	No. distributed free	No. sent on exchange
Agriculture and Livestock in India	1,000	227	102	397*
Indian Journal of Agricultural Science	800	183	40	325*
Indian Journal of Veterinary Science and Animal Husbandry	650	145	35	275*
Scientific Monographs	500	47	20	180

(d) *Editorial Committee and Referees.*—Professor P. K. Parija, M.A., I.E.S., Ravenshaw College, Cuttack, served as a representative of the Universities on the Editorial Committee of the Council during 1934-35. The Editorial Committee continued to receive the assistance of a large number of specialist referees, numbering seventy-five, in the examination of articles received for publication. The Committee take this opportunity of acknowledging the services of these specialist referees and Professor Parija in connection with the publication of its journals.

26. *Library*—

(*i*) *General*: The progress reported in the previous years continued to be maintained during the year under review. It receives about 270 scientific and technical periodicals from various countries and has exchange relations with important centres of agricultural and veterinary research throughout the world. These exchanges are steadily increasing and the

*Includes copies distributed by the Director, I. I. A. R., Delhi.

supply of publications from this source forms an important addition as will be seen from the following figures :—

Name of countries	Total number of books, bulletins and reports	No. of periodicals received
1. Africa	49	2
2. Argentina	4	..
3. Australia	52	2
4. Austria	..	1
5. Brazil	1	1
6. British Guiana	..	1
7. Canada	59	1
8. China	6	2
9. Cyprus	..	1
10. Dutch East Indies	9	3
11. Fiji	..	1
12. France	..	1
13. Germany	11	7
14. Great Britain	169	20
15. Holland	11	..
16. India—		
(*a*) Local Governments	254	22
(*b*) States and private societies	96	35
17. Indo-China	..	1
18. Italy	3	2
19. Japan	1	5
20. League of Nations	47	5
21. Malaya States	16	3
22. New Zealand	1	1
23. Philippines	...	3
24. Russia	63	6
25. United States of America	934	8
26. West Indies	10	1
Total	1,796	135

It will be observed that the Library received as exchanges, 1,796 books, bulletins, monographs and reports and 135 periodicals; these constituted about two-thirds of the total additions

during the year; 356 books and 89 periodicals costing about Rs. 4,500 were purchased from the Research funds of the Council.

(*ii*) *New additions and stock*: (*a*) *Books.*—The Library had 11,259 volumes at the beginning of the year besides a collection of 6,000 pamphlets. 1,886 books and 621 pamphlets were added during the year. The new additions comprise 356 volumes purchased from the Research funds of the Council, 1,796 received in exchange and the rest as gifts. Thus at the close of the year the Library had 13,145 volumes and 7,000 pamphlets in stock. Grateful acknowledgment is due to the United States Department of Agriculture and the various Experiment Stations, which continue to supply a large number of their publications free of cost.

The following important back-sets of periodicals were purchased:—

1.	Proceeding of the Indian Science Congress.	Volumes 1-12 (1914-1925) and 15-20 (1928-1933).
2.	Journal of the Asiatic Society of Bengal.	Volumes 1-29 (1905-1933).
3.	American Society of Animal Production—Record of Proceedings.	1924-1933.

(*b*) *Current periodicals.*—The number of current periodicals has increased from 226 to 270 chiefly by way of exchange, 89 of these periodicals are purchased. A revised list of important periodicals is given at Appendix IX.

(*iii*) *Cataloguing*: A printed catalogue comprising entries for all books and publications received up to 31st December 1934 is now in the press, and will shortly be available for distribution. Besides the printed catalogue the Library maintains a 'dictionary' card catalogue, which is kept up-to-date. About 5,000 typed cards were added to this catalogue.

(*iv*) *Circulation*: The number of books borrowed from the Library during the year increased to 1,391 as compared with 1,234 last year. Of this number 237 volumes (against 51 in 1933-34) were issued out to the officers of the Agricultural and Veterinary Departments in the Provinces and other research workers. There has also been a corresponding increase in the circulation of current periodicals to the officers and staff of the Department. In addition to the books circulated for home use more than 800 were consulted in the Library Reading Room, where ample reference facilities are available.

(*v*) *Reference work*: Information regarding literature on various subjects of agricultural and veterinary interest is furnished to research workers on request and several lists of references and bibliographies were supplied in response to the inquiries received in the Library.

27. *Accounts.*—A statement of audited accounts of the Council for 1934-35 is given in Appendix X.

28. *Scientific and Technical Officers.*—A list (Appendix XI) of scientific and technical officers paid from the research grants of the Imperial Council of Agricultural Research as on the 1st April 1935 is also appended.

N. C. Mehta,
Secretary.

APPENDIX I.

Memorandum of Association of the Imperial Council of Agricultural Research.

* * * * *

2. The objects for which the Imperial Council of Agricultural Research is established are :—

(*a*) To aid, develop and co-ordinate agricultural and veterinary research in India by promoting scientific (including technological research, instruction and experiments in the science), methods and practice of agriculture (including the marketing of agricultural produce) and by promoting veterinary research and instruction in veterinary science, by the diffusion of useful information and by such other means as appear calculated to develop agricultural and veterinary research.

(*b*) To act as a clearing house of information not only in regard to research but also in regard to agricultural and veterinary matters generally.

(*c*) For the purposes of the Society to draw and accept and make and endorse discount and negotiate Government of India and other promissory notes, bills of exchange, cheques or other negotiable instruments.

(*d*) To invest the funds of, or money entrusted to, the Society upon such securities or in such manner as may from time to time be determined by the Governing Body and from time to time to sell or transpose such investments.

(*e*) To purchase, take on lease, accept as a gift or otherwise acquire, any land or building, wherever situate in India, which may be necessary or convenient for the Society.

(*f*) To construct or alter any building which may be necessary for the Society.

(*g*) To sell, lease, exchange and otherwise transfer all or any portion of the properties of the Society.

(*h*) To establish and maintain a research and reference library in pursuance of the objects of the Society with reading and writing rooms and to furnish the same with books, reviews, magazines, newspapers and other publications.

(*i*) To do all other such things as the Society may consider necessary, incidental or conducive to the attainment of the above objects.

* * * * *

APPENDIX II.

Imperial Council of Agricultural Research—Governing Body.

1. The Hon'ble Kunwar Sir Jagdish Prasad, Kt., C.S.I., C.I.E., O.B.E., Chairman, Imperial Council of Agricultural Research.
2. Diwan Bahadur Sir T. Vijayaraghavacharya, K.B.E., Vice-Chairman.
3. The Hon'ble Minister for Agriculture, Madras Presidency, Madras.
4. The Hon'ble Minister for Agriculture, Bombay Presidency, Secretariat, Fort, Bombay.
5. The Hon'ble Minister for Agriculture, Bengal, Secretariat, Calcutta.
6. The Hon'ble Minister for Education, United Provinces, Secretariat, Lucknow/Naini Tal.
7. The Hon'ble Minister for Agriculture, Punjab, Secretariat, Lahore/Simla East.
8. The Hon'ble Minister for Agriculture, Burma, Secretariat, Rangoon.
9. The Hon'ble Minister for Agriculture, Bihar and Orissa, Patna/Ranchi.
10. The Hon'ble Minister for Agriculture, Central Provinces, Nagpur/Pachmarhie.
11. The Hon'ble Minister for Agriculture, Assam, Secretariat, Shillong.
12. The Hon'ble Minister for Agriculture, North-West Frontier Province, Peshawar.
13. The Revenue and Police Member, the Government of H. E. H. the Nizam of Hyderabad, Commerce and Industries Department, Hyderabad, Deccan.
14. The Member in Charge of Agriculture, Mysore Executive Council, Bangalore.
15. The Member in Charge of Agriculture, Baroda Executive Council, Baroda.
16. The Diwan of Cochin, Ernakulam.
17. The Diwan of Travancore, Trivandrum.
18. The Revenue Member, Bhopal State Council, Bhopal.
19. The Hon'ble Sir Frank Noyce, K.C.S.I., C.B.E., I.C.S., Member of the Governor General's Executive Council, in charge of Industries and Labour.
20. The Hon'ble Diwan Bahadur G. Narayanaswami Chetti Garu, C.I.E., Gopathy Villa, San Thome, Madras.
21. Pandit Sri Krishna Datt Palival, M.L.A., "Sainik Office", Agra.
22. Vacant.
23. Sir Joseph Kay, Kt., c/o Messrs. W. H. Brady & Co., Ltd., Royal Insurance Buildings, Churchgate Street, Fort, Bombay.
24. P. J. Kerr, Esq., M.R.C.V.S., I.V.S., Director, Civil Veterinary Department and Veterinary Adviser to the Government of Bengal. Calcutta.
25. P. H. Carpenter, Esq., Chief Scientific Officer, Indian Tea Association, Tocklai Experimental Station, Cinnamara P. O. (Assam).
26. Chunilal B. Mehta, Esq., 51, Marwari Bazar, Bombay 2.

APPENDIX II—*contd.*

Imperial Council of Agricultural Research—Advisory Board.

1. The Vice-Chairman, Imperial Council of Agricultural Research.
2. The Agricultural Expert, Imperial Council of Agricultural Research.
3. The Animal Husbandry Expert, Imperial Council of Agricultural Research.
4. A. M. Livingstone, Esq., Agricultural Marketing Adviser to the Government of India and temporary Marketing Expert, Imperial Council of Agricultural Research.
5. The Director, Imperial Institute of Agricultural Research, Civil Lines, Delhi.
6. The Director, Imperial Institute of Veterinary Research, Muktesar (Kumaon).
7. The Director, Indian Institute of Science, Bangalore.
8. The Diirector of Agriculture, Madras.
9. The Director of Agriculture, Bombay Presidency, Poona.
10. The Director of Agriculture, Bengal, P. O. Ramna, Dacca.
11. The Director of Agriculture, United Provinces, Lucknow.
12. The Director of Agriculture, Punjab, Lahore.
13. The Director of Agriculture, Burma, Rangoon.
14. The Director of Agriculture, Bihar and Orissa, Patna.
15. The Director of Agriculture, Central Provinces, Nagpur.
16. The Director of Agriculture, Assam, Shillong.
17. The Agricultural Officer, North-West Frontier Province, Taru Jabba, *via* Peshawar.
18. P. T. Saunders, Esq., O.B.E., M.R.C.V.S., I.V.S., Director of Veterinary Services, Madras.
19. E. S. Farbrother, Esq., M.R.C.V.S., I.V.S., Director of Veterinary Services, Bombay Presidency, Poona.
20. P. J. Kerr, Esq., M.R.C.V.S., I.V.S., Director, Civil Veterinary Department and Veterinary Adviser to the Government of Bengal, Calcutta.
21. T. J. Egan, Esq., I.V.S., Director, Civil Veterinary Department, United Provinces, Lucknow.
22. T. F. Quirke, Esq., M.R.C.V.S., I.V.S., Director of Veterinary Services, Punjab, Lahore.
23. D. T. Mitchell, Esq., M.R.C.V.S., Director of Veterinary Services, Burma, Rangoon.
24. Major P. B. Riley, I.V.S., Director of Veterinary Services, Bihar and Orissa, Patna.
25. The Director of Veterinary Services, Central Provinces, Nagpur.
26. Rai Sahib Sirish Chandra Ghosh, G.B.V.C., Office of the Superintendent, Civil Veterinary Department, Assam, Shillong.
27. S. M. A. Shah, Esq., M.R.C.V.S., Superintendent, Civil Veterinary Department, North-West Frontier Province, Peshawar.

APPENDIX II—*concld.*

Imperial Council of Agricultural Research—Advisory Board—contd.

28. The Director of Agriculture, H. E. H. the Nizam's Government, Hyderabad (Deccan).
29. The Director of Veterinary Department, H. E. H. the Nizam's Government, Hyderabad (Deccan).
30. The Director of Agriculture, Mysore State, Bangalore.
31. The Superintendent, Civil Veterinary Department, Mysore State, Bangalore.
32. The Director of Agriculture, Baroda State, Baroda.
33. The Deputy Director of Agriculture, Baroda State, Baroda.
34. The Superintendent of Agriculture, Cochin State, Cochin.
35. M. R. Ry. A. Subramania Iyer, Senior Veterinary Inspector, Cochin State, Tattamangalam (*via* Palghat).
36. The Director of Agriculture and Fisheries, Travancore, Trivandrum.
37. The Director of Agriculture, Bhopal State, Bhopal.
38. The Revenue Secretary, Bhopal State, Bhopal.
39. A. M. Mustafa, Esq., Agricultural Officer, Baluchistan, Quetta.
40. The Inspector General of Forests, Forest Research Institute, Dehra Dun.
41. Diwan Bahadur T. Raghaviah, C.S.I., Cathedral P. O., Graeme's Road, Madras.
42. Lt. Col. A. J. H. Russell, C.I.E., I.M.S., Public Health Commissioner with the Government of India.
43. Prof. C. N. Vakil, M.A., M.Sc., F.S.S., University Professor of Economics, Bombay University, Bombay.
44. Dr. T. Ekambaram, Professor, Presidency College, Madras.
45. Rao Bahadur C. Tadulinga Mudaliar, F.L.S., I/A, Sullivan Garden Road, Mylapore, Madras.
46. Dr. L. K. Hyder, C.I.E., B.A., Ph.D., Member, Public Service Commission, Simla.
47. P. H. Carpenter, Esq., Chief Scientific Officer, Indian Tea Association, Tocklai Experimental Station, Cinnamara P. O. (Assam).
48. Rao Bahadur Bhimbhai R. Naik, M.L.C., Sagrampura, Surat.
49. The Director of Veterinary Services in India, Q. M. G.'s Branch, Army Headquarters, Simla.
50. The Central Publicity Officer, Indian State Railways, Old Secretariat Buildings, Old Delhi.
51. The Chief Agricultural Officer, Sind, Karachi.
52. Mohammad Azhar Ali, Esq., Advocate, No. 131, Khialigunj, Lucknow.
53. Dr. Nazir Ahmed, M.Sc., Ph.D. (Cantab.), Director, Technological Laboratory, Indian Central Cotton Committee, Matunga, Bombay.
54. G. K. Devadhar, Esq., M.A., C.I.E., President, Servants of India Society, Poona.
55. Dr. S. S. Nehru, M.A., Ph.D., I.C.S., Collector, Mainpuri (U. P.).
56. Rao Bahadur M. Vaidyanathan, M.A., L.T., Statistician, Imperial Council of Agricultural Research.
57. Sardar Datar Singh, Cattle and Dairy Farm, Montgomery.
58. Diwan Bahadur A. Ramaswami Mudaliar Lauder's Gate St. Vepery, Madras.

APPENDIX III.

Personnel of the Tobacco Sub-Committee.

OFFICIAL.

Diwan Bahadur Sir T. VIJAYARAGHAVACHARYA, Chairman, *ex-officio.*

The Agricultural Expert, Imperial Council of Agricultural Research.

The Agricultural Marketing Adviser to the Government of India.

Dr. F. J. F. SHAW, Director, Imperial Institute of Agricultural Research

Mr. M. CARBERY, Assistant Director of Agriculture, Bengal.

The Director of Agriculture, Burma.

Mr. B. S. PATEL, Deputy Director of Agriculture, Gujerat (Bombay).

Mr. G. K. RAJU, Deputy Director of Agriculture, Guntur (Madras).

Mr. A. P. CLIFF, Deputy Director of Agriculture, North Bihar Range, Muzaffarpur (Bihar and Orissa).

The Director of Agriculture, Baroda.

NON-OFFICIALS.

Pandit BRIJ KISHEN AGA, P. O. Fatehpur, District Saharanpur.

Seth CHHOTALAL KUBERBHAI INAMDAR, Tobacco Merchant, Jodia Bazar, Karachi.

Mr. H. ABBOT, c/o The Imperial Tobacco Company of India, Ltd., Virginia House, 37, Chowringhee, Calcutta.

Mr. RAMLAL D. SHROFF, c/o Messrs. Chhaganlal Kasturchand, Lalsing Building, Shaikh Memon Street, Bombay 2.

Mr. LESLIE FREDRICK COCKS, Indian Leaf Development Co., Ltd., Chirala, M. & S. M. Railway.

Mr. K. S. SANKARAM PILLAI, Tobacco Exporter, Guntur.

Mr. H. G. P. VOSTERMANS, c/o Messrs. Spencer & Co., Ltd., Madras.

The Secretary, Imperial Council of Agricultural Research, Secretary, *ex-officio.*

APPENDIX IV.

Tobacco Sub-Committee.

Item of Agenda.	Recommendation of the Committee.	Action taken by the Council.
Research programme on Tobacco, having due regard to the scheme of work already sanctioned and to the need for further work on other types of Tobacco and in the provinces.	(*i*) That the scheme for a Cigar Curing and blending export for India, already approved, be withdrawn.	Agreed to.
Formulation of a co-ordinated programme of Agricultural research for the improvement of the Tobacco crop in India.	(*ii*) That a Tobacco Sub-Station of the Imperial Institute of Agricultural Research, Pusa, be established in the Guntur District, Madras Presidency, for work, on cigarette tobacco.	A scheme has since been sanctioned.
	(*iii*) That Co-operative experiments on the quality of tobacco grown in different parts of India be brought into operation, by providing a pair of flue curing barns each to the Agricultural Departments of Bombay, Bengal, United Provinces, Burma, Punjab, Bihar and Orissa, Central Provinces and Hyderabad, and one for Baroda.	Sanctioned.
In view of the need for encouraging alternative cash crops, to consider what steps should be taken to encourage the greater production of cigarette tobacco in India in order to take advantage both of the large internal market and of the valuable Imperial preference in the United Kingdom which is guaranteed till 1942.	The Committee suggested that the results of schemes already approved by the Imperial Council of Agricultural Research should be awaited. It also recommended that the question of Improved Marketing should await the result of the Marketing Surveys to be undertaken in connection with the Marketing Scheme.	Recommendation accepted.
Possibility of obtaining detailed statistics of tobacco production in India.	The question of detailed statistics be examined further by the Secretariat of the Council.	Recommendation accepted.
Proposal for the appointment of a Central Tobacco Committee.	There is no necessity for a Central Tobacco Committee at present.	Recommendation accepted.
Application from the Andhra University for a grant of Rs. 1,000 for a Scheme to find out the best method of extracting nicotine commercially from tobacco waste and to design an apparatus for the same.	Information regarding the work already being done by the Industrial Chemist, Bombay, should be obtained.	This was done and the Andhra University has since withdrawn their scheme.

APPENDIX V.

NOTE ON FROST-WARNINGS.

1. *Liability to frost in different parts of India.*—The following table gives the normal frequency of occasions when the minimum temperature recorded inside a standard Stevenson screen is likely to fall below 40°F. (this usually corresponds to a temperature of about 30°F. or 2° below the freezing point of water in the case of objects near the ground which are exposed to the sky and to the atmospheric conditions prevailing during the night).

TABLE.

Area.	Number of occasions when minimum temperature fell below 40°F.			
	November.	December.	January.	February.
Punjab—				
North	1—5	1—20	10—20	10—20
South	0—1	5—10	5—1	5—10
Sind—				
Upper	*Nil*	1—5	1—5	1—5
Lower	*Nil*	0—1	0—1	0—1
United Provinces—				
West	0—1	1—5	1—5	0—1
East	*Nil*	0—1	0—1	0—1
Central Provinces—				
North	*Nil*	1—5	1—5	0—1
South	*Nil*	0—1	0—1	0—1
Indore (Central India)	*Nil*	1—5	1—5	0—1

Peninsular India to the south of 17°N latitude is free from frost and as such no warnings are ever likely to be called for from this area.

It will be seen that the Punjab is most liable to frost hazard, the frequency decreasing rapidly as one moves southwards or eastwards from the Punjab. The weather in winter over North-West India is mainly controlled by a series of western depressions which enter India across the North-West Frontier and Baluchistan at intervals of about a week and move eastwards through North India towards Assam. Frosts usually occur during the incidence of cold waves which follow in the wake of some of these depressions. The Director-General of Observatories is of opinion that the prediction of frost in the Punjab and Sind is more difficult than in other areas on account of the comparatively greater uncertainty of temperature variations there during winter, the scantiness of the daily weather data from areas to the west of India and the rather complex topography of that region. This difficulty is less in the case of areas like the United Provinces, Central Provinces and Gujarat, because the earlier-known conditions in the Punjab

and Sind enable the forecasting division of the India Meteorological Department at Poona to foresee events in the eastern area with greater certainty. The issue of frost warnings to the Punjab and Sind will therefore have to be restricted to cold-waves of unusual severity. It is probable also that only on such occasions will there be real danger to crops.

The critical temperature may vary from place to place owing to the variations in the natural immunity of the crops as well as to the variations in the stage of growth of the crops at different places. The Director-General of Observatories would therefore like to know under exactly what circumstances the warnings will be required. It will be possible for him to decide how far the issue of the warnings could be undertaken only after examining carefully the replies to a questionnaire, a copy of which is enclosed.

2. *The size of the areas for which one to two day's warnings could be issued.*—The net-work of daily weather reporting stations in India is very open; in many provinces there is only one observatory to represent the weather conditions over a group of districts. It will therefore be realised that the warnings which are issued by the India Meteorological Department will apply to divisions (consisting of a number of districts) as a whole.

3. *Number of addresses to which warnings can be issued under the existing organisation.*—With his present forecasting organisation the Director General of Observatories feels that it will be difficult to cope with demands for warnings if the number of addresses in the warning list should become too large. He would, therefore, undertake to issue the frost warning telegrams for the present only to a few central addresses in each area, *e.g.*, the Director of Agriculture in the Province or State as the case may be. These central authorities in each province or state will have to arrange for the prompt dissemination of the warnings immediately on receipt to the farmers or cultivators, either by telegram or by W/T when broadcasting facilities become available. This would enable them to take some measures to mitigate the effects of what sometimes is like the onset of a major agricultural calamity.

ROYAL ASIATIC SOCIETY LIBRARY OF THE BOMBAY BRANCH

APPENDIX VI.

Sugar Committee of the I. C. of A. R.

1. The Vice-Chairman, I. C. A. R., Chairman, *Ex-officio.*
2. The Agricultural Expert, I. C. A. R., *Ex-officio.*
3. Chowdhri MUKHTAR SINGH, Daurala Sugar Works, Meerut.
4. Mr. WALCHAND HIRACHAND.
5. The Director of Agriculture, Madras, *Ex-officio.*
6. The Agricultural Chemist to the Government of Bengal, *Ex-officio* (During his present absence on leave Mr. Gosto Bihari Paul, Assistant Agricultural Chemist, as a substitute).
7. The Director of Agriculture, United Provinces, *Ex-officio.*
8. Khan Bahadur FATEH-UD-DIN, B.A., M.R.A.S. (E.), A.R.H.S., I.A.S., Deputy Director of Agriculture, Punjab.
9. The Director of Agriculture, Bihar & Orissa, *Ex-officio.*
10. The Director, Imperial Institute of Agricultural Research, *Ex-officio.*
11. Rao Bahadur T. S. VENKATRAMAN, B.A., I.A.S., Imperial Sugarcane Expert, Coimbatore.
12. The Director of Agriculture, Mysore.
13. Lala HAR SAHAI GUPTA, Zamindar, Bilari, U.P. (Sugar Manufacturer).
14. Sardar Bahadur Sir SUNDER SINGH MAJITHIA, Zamindar, Punjab.
15. Seth Haji ABDULLA HAROON, M.L.A., Concern and Sugar Factory, Bihar.
16. Mr. J. F. MILLER, Manager, Belapur Sugar Factory, Belapur, P. O. Harigaon (District Ahmednagar).
17. Mr. SARANGDHAR DAS, The Ziawadi Sugar Factory, Ziawadi, Burma.
18. Dr. J. H. HALDANE, F.I.C., c/o Messrs. Begg Sutherland & Co., Marhowrah.
19. Mr. F. A. SHERWANI, Messrs. Bashir & Co., Aligarh (Sugar Factory Proprietor).
20. Khan Bahadur SAYED MOHAMMAD HADI (Lately Director of Agriculture, Bhopal).
21. Lala HARI RAJ SWARUP, Rais and Sugar Factory Proprietor, Rambagh (Muzaffarnagar).
22. Lala SHRI RAM, Daurala Sugar Works, Daurala (Meerut Dist.).
23. Mr. D. R. NARANG, The Basti Sugar Mills Co., Ltd., Basti (B. N. W.), Secretary, Imperial Council of Agricultural Research, Secretary, *Ex-officio.*

APPENDIX VII.

Composition of Rice and Wheat Committees.

I.—*Rice Committee—*

(*a*) The Directors of Agriculture, Madras, Bombay, Bengal, United Provinces, Burma, Bihar and Orissa, Central Provinces, Assam, Hyderabad, Mysore, Baroda, Travancore and Cochin (Total 13).

(*b*) Eight representatives of rice growers (one each from the above provinces to be nominated by the local Governments (Total 8).

(*c*) The Paddy Specialist, Madras.

The Paddy Specialist, Burma.

The Paddy Specialist, Bihar.

The Economic Botanist, Bengal.

The Economic Botanist (Rice), United Provinces.

The Crop Botanist, Bombay.

Officer in Charge, Central Provinces Rice Research Station.

The Economic Botanist to Government, Assam (Total 8).

(*d*) Two Professors of Economics (or University Readers) (Total 2).

(*e*) 1. One representative of Associated Chambers of Commerce.
2. One representative of Federation of Indian Chambers.
3. One wholesale rice merchant acquainted with import and export trade.
4. One rice miller.
5, 6, & 7. Trade representatives from Madras and Bengal and a representative of the wholesale exporters of rice from Burma (Total 7).

(*f*) *Officers of the Imperial Council of Agricultural Research.*

1. The Vice-Chairman, *Chairman.*
2. The Agricultural Expert.
3. The Marketing Expert.
4. The Senior Marketing Officer (Rice).
5. The Statistician. (Total 5).

Secretary, Imperial Council of Agricultural Research, Secretary, *Ex-officio.*

(Total No. of members 43).

II.—*Wheat Committee—*

(*a*) The Directors of Agriculture, United Provinces, Punjab, Bihar and Orissa, Central Provinces, Hyderabad, Baroda and Bhopal, the Chief Agricultural Officer, Sind, the Agricultural Officer, North-West Frontier Province (Total 9).

(*b*) Five representatives of wheat growers (one from each of the above provinces except the North-West Frontier Province) nominated by the local Governments (Total 7).

APPENDIX VII—*concld.*

11.—*Wheat Committee*—contd.

(*c*) The Director, Imperial Institute of Agricultural Research, Pusa.

The Second Imperial Economic Botanist, Imperial Institute of Agricultural Research, Pusa.

The Crop Botanist, Bombay.

The Cerealist, Lyallpur.

Rust Research Officer (Dr. K. C. Mehta).

The Economic Botanist (Rabi cereals), United Provinces.

The Economic Botanist, East Bengal.

The Economic Botanist, Central Provinces.

The Economic Botanist, Sind. (Total 9).

(*d*) Two Professors (or University Readers) of Economics or Commerce (Total 2).

(*e*) 1. One representative of the Associated Chambers of Commerce.

2. One representative of the Federation of Indian Chambers.

3. One representative of the wheat trade in Karachi.

4. One representative of the wheat trade in the Punjab.

5. One representative of the wheat trade in the United Provinces.

6. One representative of the wheat trade in the Central Provinces.

7. One representative of the flour milling industry. (Total 7).

(*f*) *Officers of the Imperial Council of Agricultural Research*—

The Vice-Chairman, *Chairman.*

The Agricultural Expert.

The Marketing Expert.

The Senior Marketing Officer (Wheat).

The Statistician (Total 5).

Secretary, Imperial Council of Agricultural Research, Secretary, *Ex-officio.*

Total number of members 37.)

APPENDIX VIII.

(I)

AGENDA FOR THE FIRST MEETING OF THE BOARD OF AGRICULTURE, CROPS AND SOILS WING, TO BE HELD AT DELHI, FROM THE 25TH FEBRUARY 1935, TO THE 2ND MARCH 1935.

SUBJECT I.—*The Planning, Technique, and Interpretation of Field Experiments and the Technique of Cultivation.*

(*a*) To review the methods of experimentation and interpretation at present in use and to consider their suitability to the varying soils, crops and climatic conditions in India.

(*b*) To consider to what extent the standardisation of field plot technique throughout India is possible; also the standardisation of methods of statistical analysis.

(*c*) The need for experimental work on field plot technique so as to permit refined methods of statistical analysis to be applied to the results and to reduce avoidable experimental error to the minimum.

(*d*) The methods of testing new varieties of sugarcane in vogue at different experiment stations and the possibility of securing greater uniformity.

(*e*) To discuss the conditions under which the inter-culture of rain-fed crops is beneficial.

(*f*) The effect of the speed of various cultural implements on the tilth of the soil.

SUBJECT II.—*Soil Surveys and Soil Analyses.*

(1) (*a*) Soil classification and mapping in India.

(*b*) Soil surveys in relation to new irrigation projects, their scope and the methods to be employed.

(*c*) The optimum soil conditions for the major crops and the degree of variation permissible.

(*d*) (i) Standard methods of soil analyses for India.

(ii) Standard methods of estimating the percentage of inorganic colloids in soils.

(2) (*a*) The root systems of cultivated plants in relation to soils; and

(*b*) The effect of hydrogen-ion concentration on the development of the root system of certain crops.

SUBJECT III.—*Soil Amelioration.*

(*a*) To consider the advances already made in the control and prevention of soil erosion and the steps to be taken for the further study of the problem with special reference to agricultural methods of improvement.

(*b*) Recent advances in alkali land reclamation. The amelioration by cropping, manuring or irrigation of soils with an abnormally high pH.

(*c*) The effect of river silt on soils.

APPENDIX VIII—*contd.*

SUBJECT IV.—*The maintenance of soil fertility with special reference to the maintenance of the nitrogen level by green manures and composts.*

(*a*) Recent advances in green manuring practice: the most suitable green manuring crops; green crops in rotation with swamp rice; the economics of green manuring.

(*b*) The comparative value, from the point of view of nitrogen recuperation, of different leguminous crops, when grown in rotations.

(*c*) The relative value of various methods of preparing composts.

(*d*) The effect of heavy crops, *e.g.*, of sugarcane, on soil fertility.

SUBJECT V.—*A review of the organisations existing for agricultural propaganda and other extension work.*

(*a*) The best means of bringing the results of experimental work to the notice of cultivators with special reference to the wider use of improved technique in cultivators' practice.

(*b*) The most suitable methods of securing the rapid extension of new crops, especially improved varieties of crops, into general cultivation, the organisation required for this purpose, and for securing an adequate premium for quality during the early stages of a new crop or variety.

(*c*) The Methods found most useful in preventing crop deterioration caused by the continuous use of home-grown seed.

(*d*) Experience gained in the establishment of college graduates on agricultural holdings with Government help and under departmental guidance. The value of such holdings for demonstration purposes and seed production.

SUBJECT VI.—*The water requirements of crops.*

(*a*) To review the information now available regarding the water requirements of Indian crops and to make suggestions for future experimental work.

(*b*) The selection, or breeding, and subsequent introduction into cultivation of varieties of crops better adapted than existing varieties to the limitations of irrigation water supplies, with special reference to quick-maturing types.

SUBJECT VII.—To consider whether a Bureau of Plant Introduction should be established in India, under the Imperial Council of Agricultural Research or otherwise, for the controlled introduction and testing of new crops and for the exploration of promising regions in the search for new species.

SUBJECT VIII.—To consider, (*a*) what further measures should be taken for the improvement of the Indian fruit industry; (*b*) the need for a central fruit bureau and (*c*) the prospects of fruit-canning in India.

APPENDIX VIII—*contd.*

SUBJECT IX.—Agricultural Marketing. (Details of this subject will be furnished later).

SUBJECT X.—The influence of cheap hydro-electric power on agricultural development.

SUBJECT XI.—The action which has been taken on resolutions 1, 6, 14, 15, 16, 17, 18, 19, 20 21 and 22 passed by the Fifteenth Meeting of the Board of Agriculture, 1929.

(II)

RESOLUTIONS PASSED BY THE CROPS AND SOILS WING OF THE BOARD OF AGRICULTURE AND ANIMAL HUSBANDRY IN INDIA, HELD AT DELHI, IN FEBRUARY-MARCH 1935.

1. The Board emphasises the desirability of all experimental work in India being conducted in conformity with Fisherian technique. That results of field experiments should, if possible, be stated in a standard form which would include the number of treatments, the number of replications, the size of plots, the type of layout, the mean yields, the standard error and critical difference. That research was needed on the technique of field experiment and that a Standing Advisory Committee of the Imperial Council of Agricultural Research be established to co-ordinate work on this class of research. That further experiment in regard to the question of inter-culture of rain-fed crops was needed.

2. That an all-India soil survey based on agricultural needs is desirable and would be of considerable benefit. That no new irrigation project shall be initiated until a thorough soil survey of the areas likely to be affected has been made and the data considered.

3. That the prevention of extension of ravines (in riverine tract of the Jumna in the U. P. and the Punjab) can best be attained by systematic construction and regular maintenance of field bunds in the cultivated land at the head of the ravines to prevent their extension further inland. Side by side with the construction of bunds, steps should be taken, in immediately threatened areas on the edges of ravines, to encourage the growth of covering crops, such as, *kharif* pulses which will check scouring and the removal of surface soil. That information should be collected on the relative tolerance of different strains of important crops, namely, cotton, cane, rice and wheat to soil alkalinity, as such information is of general importance and would be of considerable practical value.

4. That further research on the question as to whether non-leguminous crops are as good as leguminous ones, is needed. Another matter requiring further study was what part of the plant was more effective as green manure.

5. I. In view of the fact that propaganda has not kept pace with research and of the necessity for getting results of research home to the actual cultivator, the Board recommends that:—

(1) in every province the number of demonstration plots on cultivators' land should be increased;

APPENDIX VIII—*contd.*

(2) the subordinate staff of Agricultural Departments in the districts should be strengthened particularly the staff of demonstration *mistries* or *Kamdars* or *Mukkadams*;

(3) the staff of agricultural departments should receive special training in the methods of propaganda by the institution of short courses of instruction and that a course on publicity methods and propaganda should be included in the curriculum of agricultural colleges;

(4) the propaganda relating to all the departments dealing with rural development should be co-ordinated and that Provincial Governments should entrust a special officer with this duty and also with the duty of intensifying propaganda work in the Departments of Agriculture;

(5) broadcasting should be introduced wherever possible for the purpose of agricultural and rural reconstruction propaganda and for giving the cultivator direct information as regards the prevailing prices of agricultural produce;

(6) the Imperial Council of Agricultural Research should be asked to undertake a study of propaganda methods in India and other countries and circulate the information obtained from time to time to all Provinces and States concerned;

(7) the Imperial Council of Agricultural Research should be asked to investigate the question of the formation of a Central Cinema Institute for making films of general and provincial interest as well as to investigate the various methods of distributing and exhibiting them in rural areas.

II. The Board recommends the extension and co-ordination of associations like the Better farming and Better living Co-operative Societies of the United Provinces and the Punjab, the Village Farmers' Associations of the Punjab, the Taluka Development Associations of Bombay, and the rural reconstruction centres in many provinces for the purpose of attacking the problem of agricultural development and rural reconstruction on the widest possible front.

III. The Board emphasizes the need to organise education, elementary and secondary, so as to provide an agricultural bias in the former and an agricultural training to a majority in the latter with a view to co-ordinate education with the needs of agriculture.

IV. The Board recommends that the State should encourage agricultural graduates and educated youth with practical agricultural training to settle on cultivable waste land and conduct agriculture on improved lines and, in order to enable them to do so on an economic basis, the State should give them such financial help as may be needed for the initial reclamation of the land and also lend on easy terms the capital required for carrying on the industry.

V. The Board recommends the preferential employment of agricultural graduates in departments of Government other than agricultural such as

APPENDIX VIII—*contd.*

the Revenue, Co-operative and the Irrigation Departments as their agricultural training would make them specially effective in the discharge of their duties.

VI. The Board recommends that an Expert Committee may be appointed by the Imperial Council of Agricultural Research to investigate the causes of crop deterioration caused by the continued use of home-grown seed.

6. That each province should collate all data available in the hands of the Agricultural or Irrigation Department and these data should be subjected to statistical analysis and review by the Imperial Council of Agricultural Research in order to verify the conclusions arrived at. If for financial reasons the provinces are unable to undertake this work it would be a suitable subject for a small grant by the Imperial Council of Agricultural Research. That the data to be obtained from the experiments in progress in Bombay-Deccan and recently sanctioned and to be carried out in the Punjab, on the water requirements of crops, will yield results of great value. That all future experiments in the watering of crops should be laid out and conducted so that the results can be subjected to statistical analysis.

7. The Board desires to draw attention of local Governments to the success which has been achieved in Madras, the United Provinces and the Punjab by Irrigation Boards, in the co-ordination of agricultural and irrigation research, for the consideration of new irrigation projects and all measures designed to promote the more efficient supply of water to crops.

8. (*i*) In the opinion of this Board a Bureau of Plant Introduction will be of great practical use. (*ii*) The functions of the Bureau would be (*a*) to facilitate the controlled imports of new species and varieties of crop plants and other plants of economic importance; (*b*) to assist explorations as and when required in India and other countries; and (*c*) to investigate methods of securing control of plant introduction. (*iii*) The Imperial Council of Agricultural Research may be invited to formulate a scheme for giving effect to these proposals.

9. That this Board desires to emphasise the value of fruit growing to Indian agriculture. It notes that the Government of India through the Imperial Council of Agricultural Research is financing both extensive schemes of fruit research and comprehensive marketing surveys. It also notes that in some provinces the Agricultural Departments have been able to do a good deal to aid fruit growers by research, demonstration, the provision of nursery stock and assistance in organisation. It desires to emphasise the importance of agricultural departments being placed in a position to render adequate assistance to fruit growers, by the provision of expert staff and funds to ensure the provision of such facilities as those described above.

10. That this Board recommends that special courses of training in scientific fruit and vegetable growing be started in all the Provincial Agricultural Colleges.

11. That this Board would like to draw the attention of local Governments to the advisabilty of registering all nurseries producing fruit trees for sale to public.

APPENDIX VIII— *concld.*

12. That in the opinion of this Board the scheme for the improvement of marketing agricultural produce recently put in operation by the Government of India and outlined in the Government of India's resolution No. F.-16-M./34, dated the 10th January 1935, is calculated to be of the greatest benefit to Indian agriculture.

13. That this Board is also of opinion that the organisation described in Government of India's resolution of January 1935, is well designed and the programme of work suitable to immediate needs.

14. That this Board considers it very important that the collection of adequate statistics should be borne in mind by the new marketing section in carrying out its scheme of work.

15. That this Board views with appreciation the success of the hydro-electric scheme in the rural areas of the Western United Provinces, and commends it to the notice of other local Governments.

APPENDIX IX.

List of Journals received in the Library, Imperial Council of Agricultural Research, New Delhi.

Agricultural Engineering.

1. IMPLEMENT AND MACHINERY REVIEW. (England). Vol. 55. (1930 to date).

Agriculture.

2. AGRICOLTURA COLONIALE. (Italy). Vol. 28. (1934 to date).
3. AGRICULTURA SINICA. (China). Vol. 1. (1934 to date).
4. AGRICULTURAL JOURNAL OF BRITISH GUIANA. Vol. 1. (1928 to date).
5. AGRICULTURAL JOURNAL, FIJI. Vol. 3. (1930 to date).
6. AGRICULTURAL INDEX. (U. S. A.). (1932 to date).
7. AGRICULTURE AND LIVE-STOCK IN INDIA. Vol. 1. (1931 to date).
8. ALLAHABAD FARMER. Vol. 4. (1930 to date).
9. AMERICAN SOCIETY OF AGRONOMY, JOURNAL OF. (New York). Vol. 21. (1929 to date).
10. BERICHTE DES OHARA INSTITUT FUR LANDWIRTSCHAFTLICHE. Vol. 5. (1931 to date).
11. BULLETINUL CULTIVAREI SI FERMENTAREI TUTUNULUI. (Bulletin de l'Institute Experimental pour la culture et la fermentation du tabac). (Rumania). Vol. 21. (1932 to date).
12. BULLETIN OF CENTRAL EXPERIMENTAL RICE STATION. (Russia). Vol. I. (1934 to date).
13. CROP REPORTS. (National Agricultural Research Bureau, China) Vol. 3. (1935 to date).
14. CYPRUS AGRICULTURAL JOURNAL. Vol. 25. (1930 to date).
15. EMPIRE JOURNAL OF EXPERIMENTAL AGRICULTURE. (England) Vol. 1. (1933 to date).
16. EXPERIMENT STATION RECORD. (U. S. Department of Agriculture). Vol. 62. (1930 to date).
17. FARMING IN SOUTH AFRICA. (Pretoria). Vol. 8 (1933 to date).
18. GARDENING REVIEW. (Madras). (1934 to date).
19. GARDENS BULLETIN. (Straits Settlements). Vol. 8. (1934 to date).
20. GIORNALE DI RISICOLTURA. (Italy). Vol. 20. (1930 to date).
21. HYDERABAD FARMER. Vol. 1. (1931 to date).
22. IMPERIAL INSTITUTE, BULLETIN OF THE. (England). Vol. 10. (1912 to date)
23. JOURNAL OF AGRICULTURAL RESEARCH. (U. S. A.). Vol. 41. (1930 to date).
24. JOURNAL OF AGRICULTURAL SCIENCE. (England). Vol. 1. (1905 to date).
25. 'KISAN'. (Patna) Vol. 1. (1933 to date).

APPENDIX IX—*contd.*

Agriculture—contd.

26. MADRAS AGRICULTURAL JOURNAL. Vol. 19. (1930 to date).

27. MALAYAN AGRICULTURAL JOURNAL. Vol. 18. (1930 to date).

28. MINISTRY OF AGRICULTURE, JOURNAL OF THE. (England). Vol. 20. (1913-14 to date).

29. MONTHLY BULLETIN OF AGRICULTURAL ECONOMIC AND SOCIOLOGY. (International Institute of Agriculture, Rome). Vol. 1. (1910 to date).

30. MONTHLY BULLETIN OF AGRICULTURAL SCIENCE AND PRACTICE. (International Institute of Agriculture, Rome). Vol. 1. (1910 to date).

31. MONTHLY CROP REPORT AND AGRICULTURAL STATISTICS. (International Institute of Agriculture, Rome). Vol. 1. (1910 to date).

32. NEW ZEALAND JOURNAL OF AGRICULTURE. Vol. 40. (1930 to date).

33. OFFICIAL RECORD. (U. S. Department of Agriculture). Vol. 9. (1931-1933). (Ceased Publication).

34. PHILIPPINE JOURNAL OF AGRICULTURE, MANILA. Vol. 2. (1931 to date).

35. PLANT INDUSTRY IN U. S. S. R. (Russia). 1934.

36. PLANTERS CHRONICLE. (Coonoor, Madras). 1934.

37. PLANTERS JOURNAL AND AGRICULTURIST. (Calcutta). 1935.

38. REVIEW OF AGRICULTURAL OPERATIONS IN INDIA. (1919 to date).

39. RHODESIA AGRICULTURAL JOURNAL. 1934.

40. RUBBER RESEARCH INSTITUTE, MALAYA, JOURNAL OF THE. Vol. 1. (1929 to date).

41. SEASONAL NOTES. (Punjab Agricultural Department). Vol. 7. (1930 to date).

42. SOUTH EASTERN AGRICULTURAL COLLEGE, WYE, KENT, JOURNAL OF THE. (1907 to date).

43. TASMANIAN JOURNAL OF AGRICULTURE. Vol. 1. (1930 to date).

44. TROPICAL AGRICULTURE. (Trinidad). Vol. 7. (1930 to date).

45. TROPICAL AGRICULTURIST. (Ceylon). Vols. 41-58, 73. (1929 to date).

46. TREUBIA. (Dutch East Indies). Vol. 1. (1919 to date).

47. WEST INDIA COMMITTEE CIRCULAR. Vol. 47. (1932 to date).

APPENDIX IX—*contd.*

Animal Husbandry and Dairying.

48. ANIMAL BREEDING ABSTRACTS. (Imperial Bureau of Animal Genetics). Vol. 1. (1933 to date).
49. AYRSHIRE CATTLE SOCIETY'S JOURNAL. 1934.
50. BLOOD-STOCK BREEDERS' REVIEW. (England). Vol. 18. (1929 to date).
51. FARMER AND STOCK-BREEDER. (England). 1931 to date.
52. HORSE BREEDING. (Delhi). Vol. 9. (1933 to date).
53. HARPER ADAMS UTILITY POULTRY JOURNAL. Vol. 17. (1931-32 to date).
54. INDIAN POULTRY GAZETTE. Vol. 21. (1932 to date).
55. INTERNATIONAL REVIEW OF POULTRY SCIENCE (Holland). Vol. 4. (1931 to date).
56. JOURNAL OF THE BRITISH GOAT SOCIETY. Vol. 27. (1934 to date).
57. JOURNAL OF THE BRITISH DAIRY FARMER'S ASSOCIATION. Vol. 43. (1931 to date).
58. JOURNAL OF DAIRY RESEARCH. (England). Vol. 1. (1929 to date).
59. JOURNAL OF DAIRY SCIENCE. (U. S. A.). Vol. 13. (1930 to date).
60. LIST OF REFERENCES FROM CURRENT LITERATURE. (Issued by the National Institute for Research in Dairying, Near Reading). (1931 to date).
61. NUTRITION ABSTRACT AND REVIEWS. (Imperial Bureau of Animal Nutrition). Vol. 1. (1931 to date).
62. ONDERSTEPOORT JOURNAL. (South Africa, Pretoria). Vol. 1. (1933 to date).
63. POULTRY AND POULTRY HUSBANDRY. (England). 1931 to date.
64. POULTRY SCIENCE. (U. S. A.). Vol. 1. (1921-22 to date).

Biology, Heredity and Genetics.

65. BIOLOGICAL ABSTRACTS. (U. S. A.). Vol. 1. (1927 to date).
66. BIOLOGICAL BULLETIN. (U. S. A.). Vol. 60. (1931 to date).
67. BIOLOGICAL REVIEWS. (England). Vol. 7. (1932 to date).
68. GENETICS. (U. S. A.). Vol. 15. (1930 to date).
69. HERBAGE ABSTRACTS. (Imperial Bureau of Plant Genetics). Vol. 1. (1931 to date).
70. JOURNAL OF GENETICS. (England). Vol. 21. (1929 to date).
71. JOURNAL OF HEREDITY. (U. S. A.). Vol. 21. (1930 to date).
72. PLANT BREEDING ABSTRACTS. (Impl. Bureau of Plant Genetics). Vol. 1. (1930 to date).
73. QUARTERLY REVIEW OF BIOLOGY. (U. S. A.). Vol. 5. (1930 to date).

APPENDIX IX—*contd.*

Botany and Mycology. (See also Genetics).

74. BULLETIN DU JARDIN BOTANIQUE. (Buitenzorg). Vol. 1. (1919 to date).

75. BULLETIN OF APPLIED BOTANY OF GENETICS AND PLANT BREEDING. [Lenin Academy of Agricultural Science in U. S. S. R. Institute of Plant Industry. 13 Series. (1931 to date)].

76. BULLETIN OF MISCELLANEOUS INFORMATION. (Kew Gardens). (1888-1889, 1901, 1906-18 and 1931 to date).

77. DER ZUCHETR. (Germany). Vol. 2. (1930 to date).

78. DIE ERNAHRUNG PER PFLANZE. (Germany). Vol. 27. (1931 to date).

79. HORTICULTURAL ABSTRACTS. (Imperial Bureau of Fruit Production). Vol. 1. (1931 to date).

80. INTERNATIONAL BULLETIN OF PLANT PROTECTION. (International Institute of Agriculture, Rome). Vol. 3. (1929 to date).

81. INDIAN BOTANICAL SOCIETY, JOURNAL OF THE. Vol. 1. (1919-20 to date).

82. NATIONAL INSTITUTE OF AGRICULTURAL BOTANY, JOURNAL OF THE. (England). Vol. 1. (1924 to date).

83. REVIEW OF APPLIED MYCOLOGY. (England). Vol. 1. (1922 to date).

84. TROPENPFLANZER. (Germany). 1930 to date.

Chemistry including Agricultural Chemistry, Biochemistry and Soil Science.

85. ANNUAL REPORT OF THE PROGRESS OF APPLIED CHEMISTRY. Vol. 1. (1916 to date).

86. ANNUAL REVIEW OF BIOCHEMISTRY. Vol. 1. (1932 to date).

87. CHEMICAL SOCIETY, JOURNAL OF THE. (England). (1928 to date).

88. HILGARDIA (U. S. A.) Vol. 3. (1928 to date). (incomplete).

89. IMPERIAL BUREAU OF SOIL SCIENCE. Publications—

(*i*) Monthly Letters. (1932 to date).

(*ii*) Publications relating to soils and fertilizers. (1932 to date).

90. INDIAN CHEMICAL SOCIETY, JOURNAL OF THE. Vol. 10. (1933 to date).

91. INDUSTRIAL CHEMIST. (England). (1932 to date).

92. INTERNATIONAL SOCIETY OF SOIL SCIENCE, PROCEEDINGS OF THE. Vol. 6. (1931 to date).

93. SOIL RESEARCH. (International Society of Soil Science). Vol. 1. (1930 to date).

94. SOIL SCIENCE. (U. S. A.). Vol. 1. (1916 to date).

APPENDIX IX—*contd.*

Commerce.

95. BOARD OF TRADE JOURNAL. (England). (1932 to date).

96. BOMBAY CHAMBER OF COMMERCE—Current Quotations. (1932 to date.)

97. CAPITAL. (Calcutta). (1931 to date).

98. COMMERCE. (Calcutta). Vol. 44. (1932 to date).

99. COMMERCE REPORTS. (U. S. A.). (1930 to date).

100. COMMERCIAL GAZETTE. (Calcutta). (1933 to date).

101. COMMERCIAL AMERICA. Vol. 29. (1932 to date).

102. DAILY IMPORT LIST. (Calcutta). (1933 to date).

103. INDIAN MERCHANTS CHAMBER, QUARTERLY JOURNAL. Vol. 25. (1932 to date).

104. INDIAN TRADE JOURNAL. Vols. 1-5, 7-27, 29-47 and 93. (1929 to date)

105. INDO-COMMERCIAL GAZETTE. (Austria). 1934.

106. MANCHESTER GUARDIAN COMMERCIAL SUPPLEMENT. (1932 to date).

107. MONTHLY SURVEY OF BUSINESS CONDITIONS IN INDIA. Vol. 1. (1933 to date).

108. TIMES ENGINEERING AND COMMERCIAL SUPPLEMENT. (England). (1932 to date).

109. OIL AND COLOUR TRADE JOURNAL. (England). (1933 to date).

Cotton and other Textiles.

110. BORODA ZA KHLOPOK (COTTON FIBRE). (Russia). (1933 to date.)

111. BULLETIN OF THE CENTRAL ASIA SCIENTIFIC RESEARCH COTTON INSTITUTE. (Russia). (1930 to date).

112. EMPIRE COTTON GROWING REVIEW. (England). Vol. 1. (1924 to date).

113. FINANCIAL NEWS. (Bombay). (Previously called 'Cotton and Finance'). Vol. 7. (1931 to date).

114. INTERNATIONAL COTTON BULLETIN. (Manchester). Vol. 7. (1929 to date).

115. RAW COTTON TRADE STATISTICS. (Department of Commercial Intelligence and Statistics, India). (1931-32 to date).

116. SUMMARY OF CURRENT LITERATURE. (British Cotton Industry Research Association). (England). Vol. 11. (1931 to date).

117. TEXTILE INSTITUTE, JOURNAL OF THE. (Manchester). Vol. 21. (1930 to date).

APPENDIX IX—*contd.*

Economics.

118. BENGAL CO-OPERATIVE JOURNAL. Vol. 18. (1932-33 to date).
119. BOMBAY CO-OPERATIVE QUARTERLY. Vol. 15. (1931 to date).
120. BULLETIN ECONOMIQUE DE L'INDOCHINE. Vol. 34. (1931 to date).
121. B. & O. CO-OPERATIVE JOURNAL. Vol. 9. (1931 to date).
122. ECONOMIC HISTORY. (A supplement of Economic Journal) (England). Vol. 2. (1931 to date).
123. ECONOMIC JOURNAL. (England). Vols. 20-22, 24-26 and 40. (1930 to date).
124. ECONOMIC JOURNAL. (Afghanistan). (1933 to date).
125. INDIAN FINANCE. (1931 to date).
126. INDUSTRIAL AND LABOUR INFORMATION. (Geneva). Vol. 35. (1930 to date).
127. MADRAS JOURNAL OF CO-OPERATION. Vol. 22. (1932 to date).
128. WIRTSCHAFTSDIENST (Germany). Vol. 20. (1935).

Entomology.

129. ARBEITEN UBER MORPHOLOGISCHE UND TOXONOMISCHE ENTOMOLOGIE AUS BERLIN-DAHLEM. (Germany). Vol. 1. (1934 to date).
130. ARBEITEN UBER PHYSIOLOGISCHE UND ANGEWANDTE ENTOMOLOGIE AUS BERLIN-DAHLEM. (Germany). Vol. 1. (1934 to date).
131. ENTOMOLOGISCHE BEIHEFTE AUS BERLIN-DAHLEM. (Germany). (1934).
132. BULLETIN OF ENTOMOLOGICAL RESEARCH. (England). Vol. 1. (1910 to date).
133. REVIEW OF APPLIED ENTOMOLOGY : SERIES 'A' (Agriculture). (England). Vol. 19. (1931 to date).
134. REVIEW OF APPLIED ENTOMOLOGY : SERIES 'B' (Veterinary). (England). Vol. 19. (1931 to date).

Forestry.

135. INDIAN FORESTER. Vols. 1-14, 37-42 and 57. (1931 to date).
136. INDIAN FOREST RECORDS. Vol. 2. (1910 to date).

General.

137. ASIATIC SOCIETY OF BENGAL, JOURNAL AND PROCEEDING OF THE. Vol. 1. (1905 to date).
138. BULLETIN OF THE PAN-AMERICAN UNION. (U. S. A.). Vol. 66. (1932 to date).
139. COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH, JOURNAL OF THE. (Australia). Vol. 1. (1927 to date).

APPENDIX IX—*contd.*

General—contd.

140. INDIAN CONCRETE JOURNAL. Vol. 5. (1931 to date).
141. INDIAN REVIEW. Vol. 30. (1929 to date).
142. INDIAN ROADS. (I. and L. Department). (1931 to date).
143. INTERCINE. (Rome). (Previously called 'International Review of Educational Cinematography'). Vol. 3. (1931 to date).
144. INSTITUTE OF BREWING, JOURNAL OF THE. (England). Vol. 33. (1927 to date).
145. MADRAS UNIVERSITY, JOURNAL OF. Vol. 1. (1928 to date).
146. NEW ZEALAND JOURNAL OF SCIENCE AND TECHNOLOGY. Vol. 10. (1923 to date).
147. ROUND TABLE. (England). (1934 to date).
148. SUMMARY OF CURRENT LITERATURE. (Department of Scientific and Industrial Research). (England). Vol. 3. (1930 to date).

League of Nations.

149. LEAGUE OF NATIONS, MONTHLY SUMMARY OF THE. Vols. 1-9 and 11 to (to date).
150. LEAGUE OF NATIONS, OFFICIAL JOURNAL. (1920 to date).
151. MONTHLY BULLETIN OF STATISTICS. (*See* under 'Statistics').
152. QUARTERLY BULLETIN OF INFORMATION ON THE WORK OF INTERNATIONAL ORGANIZATIONS. (Geneva). Vol. 3. (1931 to date).

Medicine.

153. BULLETIN OF HYGIENE. (England). Vol. 6. (1931 to date).
154. INDIAN MEDICAL GAZETTE. (1935.)
155. JOURNAL OF COMPARATIVE PATHOLOGY AND THERAPEUTICS. (England). Vol. 44. (1931 to date).
156. JOURNAL OF HYGIENE. (England). Vol. 29. (1929 to date).
157. ROYAL SOCIETY OF TROPICAL MEDICINE AND HYGIENE, TRANSACTIONS OF THE. (England). Vol. 25. (1931 to date).
158. TROPICAL DISEASES BULLETIN. (England). Vol. 28. (1931 to date).

Science—General.

159. CURRENT SCIENCE. (Bangalore). Vol. 2. (1933 to date).
160. BOMBAY NATURAL HISTORY SOCIETY, JOURNAL OF THE. Vols. 18, 11-15, 17-18, 22-28, 33. (1929 to date).
161. NATURE. (England). Vols. 119-120 and 125. (1930 to date).
162. NATURAL AND APPLIED SCIENCE BULLETIN. (Philippine University). Vol. 1. (1930 to date).
163. RECORDS OF THE GEOLOGICAL SURVEY OF INDIA. Vol. 62. (1929 to date).

APPENDIX IX—*contd.*

Statistics.

164. ACCOUNTS RELATING TO COASTING TRADE AND NAVIGATION OF BRITISH INDIA. (1933-34 to date). (Monthly).

165. ACCOUNTS RELATING TO THE INLAND (RAIL AND RIVER-BORNE) TRADE OF INDIA. (1933-34 to date). (Monthly).

166. ACCOUNTS RELATING TO TRADE AND COMMERCE OF CERTAIN FOREIGN COUNTRIES AND BRITISH COUNTRIES OVERSEAS. (England). (1930 to date). (Quarterly).

167. ACCOUNTS OF THE SEA-BORNE TRADE AND NAVIGATION OF BRITISH INDIA. (April 1929 to date). (Monthly).

168. ACCOUNTS RELATING TO TRADE AND NAVIGATIONS OF THE UNITED KINGDOM. (1931 to date). (Monthly).

169. AMERICAN STATISTICAL ASSOCIATION, JOURNAL OF THE. Vol. 28. (1933 to date).

170. BIOMETRIKA. (England). Vol. 25. (1933 to date).

171. BOMBAY BI-WEEKLY COTTON STATISTICS. (East India Cotton Association). (1933 to date).

172. KARACHI PRICE CURRENT AND MARKET REPORT. (1932 to date).

173. KATHIAWAR TRADE STATISTICS. (1933 to date).

174. MADRAS PRICE CURRENT AND MARKET REPORT. (1932 to date).

175. MONTHLY BULLETIN OF STATISTICS. (League of Nations). Vol. 12. (1931 to date).

176. MONTHLY CROP REPORT AND AGRICULTURAL STATISTICS. (International Institute of Agriculture, Rome). (*See* under 'Agriculture').

177. MONTHLY STATISTICS OF COTTON SPINNING AND WEAVING IN INDIAN MILLS. (1933 to date).

178. MONTHLY STATISTICS OF PRODUCTION OF CERTAIN SELECTED INDUSTRIES OF INDIA. (1932-33 to date).

179. ROYAL STATISTICAL SOCIETY, JOURNAL OF THE. (England). Vol. 92. (1929 to date).

180. WHOLE-SALE PRICES OF CERTAIN STAPLE ARTICLES OF TRADE AT SELECTED STATIONS IN INDIA. (1932 to date).

Sugar.

181. FACTS ABOUT SUGAR. (U. S. A.). Vol. 26. (1931 to date).

182. INTERNATIONAL SUGAR JOURNAL. (England). Vol. 32. (1930 to date).

APPENDIX IX—*contd.*

Veterinary Science.

183. American Veterinary Medical Association, Journal of the. Vol. 29. (1930 to date).
184. Annales de l'Institute Pasteur. (France). Vol. 46. (1931 to date).
185. Annalesde Medicine Veterinaire. (France). Vol. 76. (1931 to date).
186. Australian Veterinary Journal. Vol. 7. (1931 to date).
187. Boletim de Agricultura Zootechniae Veterinaria. (Brazil). Vol. 6. (1933 to date).
188. Bulletin de l'Institute Pasteur. (France). Vol 29. (1931 to date).
189. Bulletin de l'Academie Veterinary de France. Vol. 4. (1931 to date).
190. Central Provinces Veterinary Journal. Vol. 3. (1934 to date).
191. Index Veteriarius. (Imperial Bureau of Animal Health). Vol. 1. (1933 to date).
192. Indian Journal of Veterinary Science and Animal Husbandry. Vol. 1. (1931 to date).
193. Indian Veterinary Journal. Vol. 7. (1930 to date).
194. Japanese Society of Veterinary Science, Journal of the. Vol. 10. (1931 to date).
195. Journal of the Royal Army Veterinary Corps. (England). Vol. 2. (1931 to date).
196. Office International des Epizootes—Bulletin Mensuel. (France). Vol. 4. (1930 to date).
197. Punjab Veterinary Journal. (1934 to date).
198. Recueil de Medicine Veterinaire and Bulletin de la Academie Veterinaire de France. Vol. 107. (1931 to date).
199. Reciuel de Medicine Veterinaire Exotique. (France). Vol. 4. (1931 to date).
200. South African Veterinary Medical Association, Journal of the. Vol. 2. (1931 to date).
201. Veterinary Journal. (England). Vol. 87. (1931 to date).
202. Veterinary Magazine. (U. P.). Vol. 20. (1931 to date).
203. Veterinary Record. (England). (1931 to date).
204. Veterinary Bulletin. (Imperial Bureau of Animal Health). (1932 to date).
205. Wiener Tierarztliche Monatschrift. (Germany). Vol. 22. (1935).

Zoology.

206. Helminthological Abstracts. (England). (1932 to date).
207. Helminthological Society of Washington, Proceedings of the. Vol. 1. (1934 to date).
208. Journal of Helminthology. (England). Vol. 9. (1931 to date).
209. Journal of Parasitology. (U. S. A.). Vol. 17. (1930 to date).

Annual Accounts for the year 1934-35

Receipts.

Head of account.	Receipts during the year.	Remarks.
	Rs. A. P.	
1. Opening balance on 1st April 1934	5,21,280 9 2	
2. (*i*) Annual recurring grant from the Government of India for research work	5,00,000 0 0	
(*ii*) Grant from Government of India for research work connected with the promotion of Sugar Industry	2,50,000 0 0	
(*iii*) Grant for Marketing Schemes (Provincial Portion)	33,000 0 0	
(*iv*) Grant for repairs to the Mushari Sugarcane Research Station	33,000 0 0	
3. Donations from Indian States	17,500 0 0	
Rs. A. P.		
(*i*) Baroda 5,000 0 0		
(*ii*) Cochin 5,000 0 0		
(*iii*) Travancore 5,000 0 0		
(*iv*) Bhopal 2,500 0 0		
4. Interest from investments—		
(*a*) Interest from 5% loan of 1939-44	77,525 11 2	
(*b*) Interest from fixed deposits and Government of India treasury bills	22,319 14 2	
(*c*) Interest from motor car advance	164 11 0	
5. Receipts from Sugar Cable Service	5,777 1 0	
6. Receipts on account of fees for professional advice given by the Sugar Technologist to the Council to Sugar Factories	5,473 4 0	
7. Receipts from Sugar Trade Information Service	1,801 1 0	
8. Receipts from the Empire Marketing Board :—		
(*i*) In respect of moiety of expenditure payable for the Bengal and Burma rice schemes	30,000 0 0	
(*ii*) In respect of sale proceeds of consignment of mangoes to England	...	
		Rs. A. P.
9. Receipts from the Indian Central Cotton Committee in respect of moiety of expenditure payable for the "Scheme of Investigation into the Cost of Production of crops in the principal sugar and cotton tracts in India	59,256 11 0	Total receipt 55,000 0 0 Deduct half expenditure 59,256 11 0 (*Vide* items 5 & 15 on payment side). Balance carried forward (See Serial No. 14) 4,256 11 0
10. Receipts realized from various schemes financed by the Council	10,104 1 8	
11. Receipts on account of unspent balances of grants given by the Council in previous years	4,601 10 11	
12. Other Miscellaneous receipts	799 5 3	
13. Repayment of motor car advance by the Locust Research Entomologist and the Statistician	852 0 0	
14. Deposit on account of moiety of expenditure paid by the Indian Central Cotton Committee for the scheme of "Investigation into the Cost of production of crops in the principal sugarcane and cotton tracts in India"	*—4,256 11 0	
15. Receipts on account of caution money of candidates seeking admission to the Harcourt Butler Technological Institute, Cawnpore	3,345 10 0	
16. Deposit for loan of books from the Sugar Technologist to the council	25 0 0	
17. Repayment of temporary loan given to the Agricultural Marketing Advisor to the Government of India	500 0 0	
18. Repayment of advances of pay, etc., by the Research establishment at Headquarters	1,187 8 0	
Carried over	15,74,257 7 4	

* The *minus* balance is due to the instalment received from the Indian Central Cotton Committee for March 1935 having been credited in the accounts for April 1935.

DIX X.

relating to the grant for research purposes.

Payments.

Grants. Original.	Grants. Net.	Payments. Head of account.	Payments. Expenditure during the year.	Excess (—) or saving (+) over net grant.	Remarks.
Rs. A. P.	Rs. A. P.		Rs. A. P.	Rs. A. P.	
10,200 0 0	5,000 0 0	1. Sugar Committee . .	4,785 7 0	+214 9 0	Inconsiderable.
145,000 0 0	40,000 0 0	2. Scheme of Sugar Technologist.	39,443 11 9	+556 4 8	Do.
11,300 0 0	10,300 0 0	3. Sugar Cable Service .	9,354 11 5	+945 4 7	Do.
70,000 0 0	3,100 0 0	4. Grant for the establishment of Research and Testing Station for the Indigenous system of gur and sugar manufacture by the Sugar Technologist.	3,048 12 9	+51 3 3	Do.
9,500 0 0	17,700 0 0	5. Scheme of Chief Economist including cost of meetings.	17,873 6 0	—173 6 0	Do.
8,900 0 0	9,200 0 0	6. Grant to Coimbatore sugarcane sub-station at Karnal.	9,239 12 7	—39 12 7	Do.
300 0 0	...	7. Grant for Bengal Gur boiling and cane crushing scheme.	...	...	
20,000 0 0	20,000 0 0	8. Grant to Harcourt Butler Technological Institute.	20,000 0 0	...	
18,300 0 0	17,200 0 0	9. Grant for research on mosaic and other cane diseases at Pusa.	17,121 9 0	+78 7 0	Do.
23,500 0 0	*35,000 0 0	10. Grant for the establishment of a sugarcane station in Bihar and Orissa.	*35,000 0 0	...	Do.
3,300 0 0	3,000 0 0	11. Grant to the Government of Mysore for breeding of thick canes.	3,000 0 0	...	Do.
2,300 0 0	2,600 0 0	12. Grant for designing a satisfactory small power sugarcane crushing mill.	2,612 5 0	—12 5 0	Do.
2,340 0 0	2,300 0 0	13. Grant for the establishment of a sugarcane seedling testing station, Dacca.	2,052 0 0	+248 0 0	Do.
58,060 0 0	74,600 0 0	14. Grant for the Bombay Deccan Sugarcane research scheme.	74,600 0 0		
		15. Grant for "Investigation into the Cost of production of crops in the principal sugarcane and cotton tracts in Indian Provinces—			
14,900 0 0	15,000 0 0	(a) Madras . .	14,940 0 0	+60 0 0	Do.
20,500 0 0	28,000 0 0	(b) Bombay . . .	28,000 0 0	...	
19,200 0 0	...	(c) Punjab . . .	...	...	
10,000 0 0	9,400 0 0	(d) Bihar and Orissa .	9,410 0 0	—10 0 0	Do.
7,700 0 0	7,500 0 0	(e) Bengal . . .	7,520 0 0	—20 0 0	Do.
14,900 0 0	14,900 0 0	(f) United Provinces .	14,940 0 0	—40 0 0	Do.
14,800 0 0	14,700 0 0	(g) Central Provinces and Berar.	14,660 0 0	+40 0 0	Do.
4,600 0 0	3,200 0 0	(h) Hyderabad . .	3,190 0 0	+10 0 0	Do.
4,600 0 0	4,600 0 0	(i) Mysore . . .	4,580 0 0	+20 0 0	Do.
4,600 0 0	3,400 0 0	(j) Baroda . . .	3,400 0 0	...	
4,500 0 0	...	(k) Sindh . . .	...	...	
...	1,200 0 0	16. Grant to the Government of Bihar and Orissa for investigation into the production of Khandsari Sugar in Bihar and Orissa.	1,150 0 0	+50 0 0	Do.
37,800 0 0	7,700 0 0	17. Grant to Government of Madras for Sugarcane research in the Madras Presidency.	7,650 0 0	+50 0 0	Do.
		Carried over .	3,47,571 11 6		

* Includes a sum of Rs. 13,000 on account of repairs to Musharl Station.

Annual Accounts for the year 1934-35

Receipts.

Head of account.	Receipts during the year.	Remarks.
	Rs. A. P.	
Brought forward . .	15,74,257 7 4	
19. Amount credited under "suspense" pending final adjustment	63 2 3	
20. Recoveries on account of General Provident Fund and Income Tax	9,298 9 0	
Total Receipts . .	15,83,619 2 7	
Receipts of investments and re-investments from fixed deposits and treasury bills	19,98,670 14 0	
Grand Total . .	35,82,290 0 7	

Carried over . 35,82,290 0 7

DIX X—*contd.*

relating to the grant for research purposes—contd.

Payments.

Grants. Original.	Grants. Net.	Payments. Head of account.	Payments. Expenditure during the year.	Excess (—) or saving (+) over net grant.	Remarks.
Rs. A. P.	Rs. A. P.		Rs. A. P.	Rs. A. P.	
30,000 0 0	17,000 0 0	18. Grant to the Government of Punjab for the establishment of a sugarcane research station in the Punjab.	17,000 0 0	...	
15,200 0 0	11,700 0 0	19. Grant for the investigation into the various problems of sugar industry in the United Provinces.	11,700 0 0	...	
7,200 0 0	6,000 0 0	20. Grant for research on the genetics of sugarcane at the Imperial Cane-breeding Station Coimbatore.	6,008 14 0	—8 14 0	Inconsiderable
14,800 0 0	15,000 0 0	21. Grant for extension of sugarcane work at the Jorhat Experimental Station, Assam.	15,300 0 0	—300 0 0	Do
7,500 0 0	3,600 0 0	22. Indian Sugar Trade Information Service.	3,766 5 3	—166 5 3	Do.
78,000 0 0	70,000 0 0	23. Special Locust Research Staff.	67,567 2 0	+2,432 14 0	Do.
1,800 0 0	1,500 0 0	24. Central Locust Bureau .	1,502 1 0	—2 1 0	Do.
—2,000 0 0	...	25. Locust Committee .	9 10 0	—9 10 0	Do.
5,660 0 0	6,000 0 0	26. Grant to Government of Punjab for Locust Research.	6,010 0 0	—10 0 0	Do.
23,800 0 0	24,000 0 0	27. Investigations into the rusts of wheat and barley by Dr. K. C. Mehta.	—26,564 15 9	—2,564 15 9	Do.
1,500 0 0	500 0 0	28. Fertilisers Committee .	508 6 0	—8 6 0	Do.
12,500 0 0	14,500 0 0	29. Statistical Section of the Bureau of Agricultural Intelligence.	14,026 11 6	+473 4 6	Do.
9,000 0 0	5,200 0 0	30. Indian Oilseed Crushing Industry Committee.	5,249 7 0	—49 7 0	Do.
4,000 0 0	700 0 0	31. Award of a prize for a bone-crusher worked by animal and mechanical power.	652 8 0	+47 8 0	Do.
23,800 0 0	24,000 0 0	32. Grant for Botanical Sub-Station, Karnal.	24,186 14 11	—186 14 11	Do.
18,800 0 0	18,800 0 0	33. Grant for Agricultural Meteorology, Poona.	18,800 0 0	...	
9,800 0 0	9,800 0 0	34. Grant to Hyderabad Durbar for the Dry Farming Research Scheme.	9,800 0 0	...	
4,340 0 0	3,900 0 0	35. Appointment of a Physical Assistant on the Staff of Agricultural Chemist, Bengal.	3,870 0 0	+30 0 0	Do.
42,400 0 0	65,000 0 0	36. Grant to the Government of Bombay for the Bombay Deccan Dry Farming Scheme.	65,165 0 0	—165 0 0	Do.
45,000 0 0	...	37. Grant to the Government of Madras for Dry Farming Scheme in the Ceded Districts of Madras.	...	...	
3,700 0 0	3,700 0 0	38. Grant to the Government of Madras for research on potatoes.	3,800 0 0	—100 0 0	Do.
4,000 0 0	4,200 0 0	39. Grant to the Government of Bombay on account of Dr. Uppal's deputation to study virus diseases of plants.	4,193 4 0	+6 12 0	Do.
		40. Co-ordinated scheme of rice research in :—			
19,600 0 0	17,000 0 0	(i) Madras . . .	17,354 10 5	—354 10 5	Do.
26,300 0 0	50,000 0 0	(ii) Burma . . .	50,000 0 0	...	
23,740 0 0	22,800 0 0	(iii) Bengal . . .	22,760 0 0	+40 0 0	Do.
14,000 0 0	17,000 0 0	(iv) Central Provinces .	16,990 0 0	+10 0 0	Do.
		Carried over .	7,60,357 9 4		

Annual Accounts for the year 1934-35

Receipts.

Head of account.	Receipts during the year.	Remarks.
	Rs. A. P.	
Brought forward .	35,82,290 0 7	
Carried over	35,82,290 0 7	

DIX X—*contd.*

relating to the grant for research purposes—contd.

Grants. Original.			Grants. Net.			Payments. Head of account.	Payments. Expenditure during the year.			Excess (—) or saving (+) over net grant.			Remarks.
Rs.	A.	P.	Rs.	A.	P.		Rs.	A.	P.	Rs.	A.	P.	
						Brought forward .	7,60,357	9	4				
38,680	0	0	17,700	0	0	(*v*) Bihar and Orissa . .	17,700	0	0	—10	0	0	Inconsiderable.
42,870	0	0	29,000	0	0	(*vi*) Assam . . .	29,000	0	0	...			
23,900	0	0	22,900	0	0	(*vii*) United Provinces .	22,852	15	9	+47	0	3	Do.
						41. Provincial Schemes of Fruit Research—							
45,000	0	0	37,700	0	0	(*i*) Bombay . . .	38,370	0	0	—670	0	0	Do.
24,000	0	0	...			(*ii*) Madras . . .	500	0	0	—500	0	0	Do.
20,000	0	0	13,200	0	0	(*iii*) Bengal . . .	13,150	0	0	+50	0	0	Do.
25,500	0	0	20,000	0	0	(*iv*) United Provinces. .	20,000	0	0	...			
19,300	0	0	15,000	0	0	(*v*) Bihar and Orissa . .	15,030	0	0	—30	0	0	Do.
6,000	0	0	2,500	0	0	(*vi*) Punjab . . .	2,500	0	0	...			
5,700	0	0	7,200	0	0	42. Grant to the Dacca University.	7,195	0	0	+5	0	0	Do.
						43. Grant for the schemes regarding malting and brewing qualities of Barleys—							
1,550	0	0	1,100	0	0	(*i*) United Provinces . .	1,080	0	0	+20	0	0	
2,400	0	0	2,400	0	0	(*ii*) Bihar and Orissa . .	2,400	0	0	...			
1,000	0	0	400	0	0	(*iii*) Punjab . . .	400	0	0	...			
12,600	0	0	...			44. Grant to the Bengal Government for research in systematic cultivation of medicinal plants and study of food poisons by Col. Chopra.	...			...			
17,000	0	0	...			45. Tobacco experts for Bengal, Madras and Punjab.	...			...			
4,000	0	0	...			46. Grant to the Madras Government for investigation of the Chemistry of Malting Cholam.	...			...			
...			3,100	0	0	47. Grant to the Pusa Institute for research on potato breeding in Northern India.	3,050	0	0	+50	0	0	Do.
2,000	0	0	700	0	0	48. Grant to the Indian Institute of Science for extension of work on "Quality" in crops.	700	0	0	...			
1,500	0	0	300	0	0	49. Investigation of an electric method of Hygrometry by Professor J. B. Seth.	300	0	0	...			
14,260	0	0	9,500	0	0	50. Grant to H. E. H. the Nizam's Government for improvement of the Castor Crop.	9,500	0	0	...			
30,000	0	0	30,000	0	0	51. Grant to the United Provinces Government for the Oil Technological Section of the Harcourt Butler Technological Institute.	30,000	0	0	...			
10,000	0	0	...			52. Grant to the Government of the North-West Frontier Province for Entomological Survey Scheme.	...			...			
1,00,000	0	0	35,000	0	0	53. Marketing Scheme .	35,681	9	0	—681	9	0	Do.
2,000	0	0	1,800	0	0	54. Prof. Mukherjee's scheme of colloid soil constituents.	1,785	0	0	+15	0	0	Do.
10,000	0	0	6,500	0	0	55. Prof. Mahalanobis' scheme of Experimental errors in fields trials.	6,500	0	0	...			
						56. Prof. Bhatnagar's scheme—							
230	0	0	...			(*i*) Effects of ions on plant growth.	...			...			
1,380	0	0	...			(*ii*) Physico-chemical properties and fertility of soil.	...			...			
2,470	0	0	2,500	0	0	57. Prof. Dastur's Scheme of rice physiology.	2,450	0	0	+50	0	0	Do.
						Carried over .	10,20,512	2	1				

APPEN

Annual Accounts for the year 1934-35

Receipts.

Head of account.	Receipts during the year.	Remarks.
	Rs. A. P.	
Brought forward .	35,82,290 0 7	
Carried over .	35,82,290 0 7	

relating to the grant for research purposes.

Grants. Original.	Grants. Net.	Payments. Head of account.	Payments. Expenditure during the year.	Excess (—) or saving (+) over net grant.	Remarks.
Rs. A. P.	Rs. A. P.		Rs. A. P.	Rs. A. P.	
		Brought forward .	10,20,512 2 1		
3,350 0 0	3,600 0 0	58. Prof. Chaudhuri's scheme of Wither Tip of citrus trees.	3,650 0 0	—50 0 0	Inconsiderable.
2,500 0 0	2,100 0 0	59. Investigation on the organic constituents of Indian Soils.	2,110 0 0	—10 0 0	Do.
2,000 0 0	2,300 0 0	60. Preparation of cheap synthetic manure from town refuse and waste materials.	2,310 0 0	—10 0 0	Do.
9,500 0 0	8,800 0 0	61. Appointment of a Physiological Chemist to study animal nutrition, Dacca.	8,800 0 0	...	
5,000 0 0	6,400 0 0	62. Dr. Slater's scheme of Goat Breeding.	6,430 0 0	—30 0 0	Do.
50,000 0 0	...	63. Research work at the Anand Creamery into the products of milk.	...	...	
3,500 0 0	4,200 0 0	64. Investigation into the most suitable and economic methods of combating different types of parasitological infections in the fields.	4,200 0 0	...	
	3,000 0 0	65. Grant for investigation of Johnes disease among cattle in Mysore.	3,000 0 0	...	
...	5,700 0 0	66. Grant for investigation of Indian Fish poisons and other Indian Forest products for their insecticidal properties.	5,700 0 0	...	
4,200 0 0	...	67. Grant for research on composition of milk.	...	...	
9,500 0 0	...	68. Grant for research on animal nutrition in the Madras Presidency.	...	...	
15,000 0 0	2,700 0 0	69. Investigation into vaccination of cattle against rinderpest.	2,700 0 0	...	
		70. Appointment of Veterinary Investigation Officers in Provinces :—			
10,000 0 0	10,000 0 0	(*i*) Bombay . . .	10,000 0 0	...	
9,240 0 0	8,500 0 0	(*ii*) Bengal . . .	8,500 0 0	...	
9,330 0 0	8,200 0 0	(*iii*) Punjab . . .	8,220 0 0	—20 0 0	Do.
9,230 0 0	8,000 0 0	(*iv*) Bihar and Orissa .	8,000 0 0	...	
8,300 0 0	8,000 0 0	(*v*) Central Provinces .	8,170 0 0	—170 0 0	Do.
8,000 0 0	...	(*vi*) Madras . . .	...	...	
8,330 0 0	...	(*vii*) United Provinces .	...	...	
8,200 0 0	9,900 0 0	(*viii*) Assam . .	9,950 0 0	—50 0 0	Do.
9,560 0 0	8,200 0 0	(*ix*) Hyderabad . .	8,180 0 0	+20 0 0	Do.
5,600 0 0	...	71. Appointment of a Protozoologist.	...	...	
400 0 0	500 0 0	72. Appointment of a Statistician for the compilation of certain statistics relating to feeding scales in Military Dairies.	470 13 0	+29 3 0	Do.
4,900 0 0	4,400 0 0	73. All-India Animal Husbandry Bureau.	4,284 0 0	+116 0 0	Do.
500 0 0	300 0 0	74. Participation of India in the 5th World Poultry Congress, Rome.	302 15 0	—2 15 0	Do.
...	1,100 0 0	75. Deputation of India's representatives to the 10th World Dairy Congress, Rome.	1,113 6 0	—13 6 0	Do.
		Carried over . .	11,26,603 4 1		

APPEN

Annual Accounts for the year 1934-35.

Receipts.

Head of account.	Receipts during the year.	Remarks.
	Rs. A. P.	
Brought forward	35,82,290 0 7	
Carried over	35,82,290 0 7	

DIX X—*contd.*

relating to the grant for research purposes

Grants. Original.	Grants. Net.	Payments. Head of account.	Payments. Expenditure during the year.	Excess (—) or saving (+) over net grant.	Remarks.
Rs. A. P.	Rs. A. P.		Rs. A. P.	Rs. A. P.	
		Brought forward .	11,26,603 4 1		
...	2,200 0 0	76. Dairy Legislation .	2,217 13 6	—17 13 6	Inconsiderable.
...	4,000 0 0	77. Deputation of India's Representatives to the Third International Locust Conference, London.	3,889 13 0	+110 3 0	Do.
...	100 0 0	78. Deputation of India's Representatives to the Congress of the Royal Institute of Public Health, Norwich.	127 8 0	—27 8 0	Do.
1,200 0 0	1,300 0 0	79. Contribution to the International Office of Epizootics, Paris.	1,310 6 0	—10 6 0	Do.
8,000 0 0	8,000 0 0	80. Contributions to the Imperial Mycological Institute, London.	8,000 0 0	...	
12,000 0 0	13,200 0 0	81. Contribution to the International Institute of Agriculture, Rome.	13,154 3 0	+45 13 0	Do.
29,170 0 0	29,200 0 0	82. Contribution to the Imperial Agricultural Bureaux, London.	29,166 11 0	+33 5 0	Do.
1,330 0 0	1,300 0 0	83. Contribution to the Imperial Institute of Entomology.	1,333 5 0	—33 5 0	Do.
700 0 0	...	84. Cost of representation of India on the Executive Council of the Imperial Agricultural Bureaux, London.	...	...	
...	9,700 0 0	85. Contribution for the maintenance of the laboratory at Farnham House and investigation at Slough.	9,666 11 0	+33 5 0	Do.
	600 0 0	86. Miscellaneous Committee	727 3 0	—127 3 0	Do.
7,000 0 0	6,000 0 0	87. Books and Publications .	6,224 5 2	—224 5 2	Do.
9,000 0 0	9,500 0 0	88. Accounts and Audit .	9,713 11 3	—213 11 3	Do.
6,000 0 0	10,500 0 0	89. Travelling allowance of non-official members of the Council.	10,418 9 0	+81 7 0	Do.
3,000 0 0	6,400 0 0	90. Travelling allowance of visitors other than members attending meetings of the Council.	6,317 10 0	+32 6 0	Do.
1,000 0 0	300 0 0	91. Editorial Committee .	276 8 0	+23 8 0	Do.
500 0 0	1,500 0 0	92. Miscellaneous . .	1,411 8 0	+88 8 0	Do.
500 0 0	300 0 0	93. Cost of exhibits for World's Grain Exhibition and Conference.	325 15 0	—25 15 0	Do.
3,000	3,000 0 0	94. Sub-Section of Imperial Agricultural Bureaux, London.	2,898 5 0	+101 11 0	Do.
500	1,100 0 0	95. Enquiry into the supply of coconut products and coconut oil in India.	1,066 10 0	+33 6 0	Do.
...	500 0	96. Surcharge, etc., on Income Tax	458 6 0	+41 10 0	Do.
...	...	97. Motor Car Advance to the Statistician to the Council.	...	...	
		Carried over .	12,35,308 5 0		

APPEN

Annual Accounts for the year 1934-35

Receipts.

Head of account.	Receipts during the year.	Remarks.
	Rs. A. P.	
Brought forward	35,82,290 0 7	
Total	35,82,290 0 7	

DIX X—*contd.*

relating to the grant for research purposes.

Payments.

Grants. Original.	Grants. Net.	Payments. Head of account.	Expenditure during the year.	Excess (—) or saving (+) over net grant.	Remarks.
Rs. A. P.	Rs. A. P.		Rs. A. P.	Rs. A. P.	
		Brought forward .	12,35,308 5 0		
...	...	98. Permanent advance to the Secretary, Imperial Council of Agricultural Research and the Locust Research Entomologist.	750 0 0	...	
...	...	99. Refund of caution money to candidates seeking admission to the Harcourt Butler Technological Institute, Cawnpore.	3,255 6 0	...	
...	...	100. Refund of deposit received by the Sugar Technologist for loan of books.	54 0 0	...	
...	...	101. Advances repayable given to the Research establishment at Headquarters.	2,027 8 0	...	
...	...	102. Temporary loan to the Agricultural Marketing Adviser to the Government of India.	500 0 0	...	
...	...	103. Amount debited under "Suspense" pending final adjustment.	63 2 3	...	
...	...	104. Remittances on account of General Provident Fund and Income Tax, etc.	6,970 15 0	...	
		Total Expenditure .	12,48,929 4 3	...	
...	...	Investments and re-investments in fixed deposits.	18,48,670 14 0	...	
...	...	By balance . . .	4,84,689 14 4	...	
		GRAND TOTAL .	35,82,290 0 7	...	

APPENDIX X—*concld.*

	Amount. Rs. A. P.
II.—Particulars of Advances (Permanent and Temporary) outstanding at the end of the year.—	
Particulars.	
1. Permanent advance with the Locust Research Entomologist, Karachi .	1,500 0 0
2. Permanent advance with the Sugar Technologist, Cawnpore . . .	450 0 0
3. Permanent advance with the Secretary, Imperial Council of Agricultural Research	250 0 0
4. Temporary advance with the Librarian, Imperial Council of Agricultural Research, New Delhi . .	10 0 0
Total . . .	2,210 0 0

	Face value. Rs. A. P.	Purchase value. Rs.	Approximate market value. Rs.	Rs. A. P.
III.—Particulars of Securities, etc.—				
1. 5 per cent. loan of 1939-44 (G. P. notes kept by the Controller of Currency) .	15,54,400 0 0	14,99,996	16,65,151	@ 107 2 0 for Rs. 100.
2. Five receipts for 2 per cent. fixed deposits No. 3061 to 3065, dated 5th April 1934 for Rs. 1,00,000 each	5,00,000 0 0	5,00,000	5,00,000	
3. Two receipts for 2 per cent. fixed deposits No. 3165 and 3185, dated 27th July 1934 and 18th August 1934 for Rs. 50,000 and Rs. 1,00,000 respectively . . .	1,50,000 0 0	1,50,000	1,50,000	
4. Four fixed deposit receipts Nos. 3267 to 3270, dated the 20th November 1934 for Rs. 50,000 each repayable at 7 days' notice . . .	2,00,000 0 0	2,00,000	2,00,000	
IV.—Particulars of closing balance—				
1. Cash in hand with the Secretary of the Council . . .	1 9 6*			1 9 6* Stamps.
2. Cash in current account with the Imperial Bank of India, Simla . . .	4,84,688 4 10			
Total .	4,84,689 14 4	Total .		1 9 6

(Sd.) BAZLUL KARIM, *Officiating Secretary,*
Imperial Council of Agricultural Research.

The accounts have been examined and according to the best of my information as a result of a test audit of the books of the Imperial Council of Agricultural Research and consideration of explanations given the accounts are correct subject to the remarks made in my Report of even date.

(Sd.) J. L. SINHA,
for *Examiner,*
Outside Audit Department.

NEW DELHI ;
The 1st August, 1935.

APPENDIX XI.

List of Scientific and Technical Officers paid from the research grant of the Imperial Council of Agricultural Research as on 31st March 1935.

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed.	Remarks.
Sugar Technology :—					
1. Office of Sugar Technologist, Imperial Council of Agricultural Research, Cawnpore.	Sugar Technologist .	R. C. Srivastava, Esq., M.Sc. (Allahabad), B.Sc. (Tech.) Manchester.	4th July, 1930 .	On deputation from the United Provinces Government.	
	Temporary Technical Assistant.	S. N. Gundoo Rao, Esq., B.Sc., Assoc. H. B. T. I.	20th October, 1934.	Do.	
2. Research and Testing Station (Bilari).	Engineer . . .	J. P. Mukerjee, Esq., B.Sc., (Electrical and Mechanical Engineering), Benares Hindu University.	23rd December, 1933.	By the Public Service Commission (India).	
3. Bureau of Sugar Standards.	Temporary Assistant Chemist.	N. C. Verma, Esq., B.Sc., Assoc. H. B. T. I.	11th March, 1935.	By selection.	
Locust Research Scheme.	Locust Research Entomologist to the Imperial Council of Agricultural Research, Karachi.	Rao Sahib Y. Ramchandra Rao, M.A.	13th December, 1930.	On foreign service lent by the Madras Agriculture Department.	
	Assistant Locust Research Entomologist, Pasni.	Dr. K. R. Karandikar, Ph.D.	18th October, 1931.	Direct appointment.	

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed.	Remarks.
Sugar Technology—contd.	Locust Research Assistant, Khanpur.	Mr. Keshodas Baweja, M.Sc.	12th December, 1930.	On foreign service lent by the Punjab Agricultural College, Lyallpur.	
	Locust Research Assistant, Mirpurkhas.	Mr. Des Raj Bhatia, M.Sc.	2nd January, 1931.	Through the Public Service Commission (India).	
	Locust Research Assistant, Pasni.	Mr. Atul Chandra Sen, M.Sc.	20th January, 1931.	Through the Public Service Commission (India).	
	Locust Research Assistant, Ambagh.	Mr. S. M. Taqi Ahsan, M.Sc.	28th March, 1934.	Direct appointment.	
	Locust Research Assistant, Karachi.	Mr. R. N. Batra, M.Sc. .	27th May, 1935	Direct appointment.	
Statistical—Field Experiment.	Statistician . .	Rao Bahadur M. Vaidyanathan, M.A., L.T.	6th July 1930 .	By the Public Service Commission (India).	
	Statistical Assistant .	Mr. S. Subramania Iyer, M.A.	5th June, 1933	By the Public Service Commission (India).	
	Agricultural Assistant	Mr. T. Krishnamurthy, B.Sc. (Ag.).	11th February, 1935.	By the Public Service Commission (India).	
Cost of Production .	Chief Economist .	Dr. R. D. Kapur, M.A., B.Sc., Ph.D.	18th July, 1932	By the Public Service Commission (India).	
Imperial Institute of Agricultural Research, Pusa.					
1. Botanical Sub-Station, Karnal.	1. Superintendent .	Mr. Kashi Ram (Offg.) .	12th April, 1934.	By promotion from the Department.	
	2. Assistant . .	Mr. R. B. Ekbote, L.Ag. .	20th February, 1933.	Through the Public Service Commission (India).	

2. Sugarcane Sub-Station, Karnal.	1. Assistant . .	Mr. G. V. James . .	16th April, 1931	By promotion from the Department.	
3. Scheme for research into Mosaic and other diseases of sugarcane, Pusa.	1. Sugarcane Mycologist.	Vacant	...	..	The post was held by Dr. S. V. Desai who has been appointed to the Punjab Agricultural Service, Class I. A successor is being recruited.
	2. Assistant Mycologist.	Mr. L. S. Subramaniam .	23rd June, 1933.	Through the Public Service Commission (India).	
	3. Research Assistant	Mr. S. A. Rafay, M.Sc. .	17th October, 1932.	Through the Public Sevice Commission (India).	
4. Scheme for research on Genetics of Sugarcane at the Imperial Cane Breeding Station, Coimbatore.	1. Geneticist . .	Miss E. K. Janaki Ammal, M.A., M.Sc., D.Sc.	26th May, 1934	Through the Public Service Commission (India).	
MADRAS.					
Agricultural Schemes.					
1. Rice Research Station, Ganjam.	Superintendent, Rice Research Station, Berhampore.	Mr. Samuel Jobitha Raj, B.A. (Zoology and Botany).	27th March, 1932.	Promoted from the Madras Agricultural Subordinate Service, Class I, Upper Subordinate.	
	Assistant . . .	Mr. M. B. Venkatanarasinga Rao, B.A. (Mathematics and Physics). B.Sc. Ag., underwent post-graduate course in plant genetics at Pusa.	11th April, 1932	Transferred from the Department.	
	Assistant . . .	Mr. K. B. Viswanathan, B.Sc. Ag.	1st May, 1932 .	Transferred from the Department.	
	Assistant . . .	Mr. P. Somayajulu, B.Sc. Ag.	15th December, 1933.	Recruited through the Madras Service Commission.	

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed.	Remarks.
MADRAS—*contd.*					
Agricultural Schemes —contd.					
2. Research on Potatoes in the Madras Presidency.	Superintendent, Potato Research Station, Nanjanad.	Mr. V. K. Subramanya Mudaliyar, L.Ag.	13th June, 1933.	Promoted from the Madras Agricultural Subordinate Service Class I—Upper Subordinates.	
3. Sugarcane Research, Anakapalle.	Farm Manager, Agricultural Research Station, Anakapalle.	Mr. R. Vasudeva Rao Nayudu, L. Ag.	29th April, 1933.	Transferred from the Department.	
	Botany Assistant .	Mr. S. Ramaswami Ayyar, B.Sc. Ag.	11th May 1933.	Transferred from the Department.	
4. Dry Farming Scheme, Hagari. (Madras Presidency).	Superintendent, Agricultural Research Station, Hagari.	C. Vijayaraghava Acharya, L.Ag.	14th April, 1934.		
	Assistant for Millets .	Mr. P. Seshadri Sarma, B.Sc. Ag.	7th May, 1934 .	Transferred from the Department.	
	Assistant for Millets .	Mr. B. L. Narasimhamurthi, B.Sc. Ag.	7th May, 1934 .	Transferred from the Department.	
	Assistant to the Soil Physicist.	Mr. A. Abdul Samad, (Physics and Chemistry), B.Sc. Ag.	7th May, 1934 .	Transferred from the Department.	
5. Fruit Research Scheme (Madras Presidency).	Farm Manager, Fruit Research Station.	Mr. S. Madhava Rao, B.A. (Physical Science), B.Sc. (Poona), Horticulture (Advanced).	1st March, 1935.	Transferred from the Department.	
6. Economic Enquiry into the cost of production of crops in the principal sugarcane and cotton tracts in the Madras Presidency.	District Agricultural Supervisor, Coimbatore.	Mr. M. Subramanya Pillai, L.Ag.	1st April, 1933.	Transferred from the Department.	

	District Agricultural Supervisor, Bellary.	Mr. V. N. Subbanna Acharya, L.Ag.	5th October, 1934.	Transferred from the Department.	
	District Agricultural Supervisor, Anakapalle.	Mr. V. Achyutaramayya, L.Ag.	13th November 1934.	Transferred from the Department.	
7. Marketing Scheme	Assistant Marketing Officer.	Mr. S. N. Venkatarama Ayyar, B.A. (Physics and Chemistry), B.Sc. Ag., underwent Statistical training at Calcutta.	21st February, 1935.	Promoted from the Department.	
	Assistant Marketing Officer.	Mr. M. P. Kunhikutti, L.Ag. Underwent post-graduate course in Animal Husbandry and Dairying.	23rd February, 1935.	Promoted from the Department.	
	Assistant Marketing Officer.	Mr. K. W. Chakrapani Marar	25th February, 1935.	Promoted from the Department.	
Animal Husbandry Scheme.					
Veterinary Diseases Investigation Scheme.	Veterinary Investigation Officer, Madras.	Mr. G. R. Viswanathan, G.M.V.C., post-graduate training in the United Kingdom and post-graduate course at Muktesar.	13th April, 1933	Promoted from the Department.	
BOMBAY.					
1. Investigation of diseases in livestock and their treatment.	Veterinary Investigation Officer, Bombay Presidency.	Mr. R. N. Naik, G.B.V.C.	27th June, 1932	Recruited through the Public Service Commission (India).	
2. Rice Physiology	Rice Research Assistant.	Mr. B. L. Desai, M.Sc.	1st June, 1932	Appointed by the Educational Department, Bombay.	The appointment terminated on 31st May 1935. Mr. B. L. Desai was relieved in the afternoon of 31st May 1935.

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed.	Remarks.
BOMBAY—*contd.*					
3. Economic Enquiry into the cost of production of cotton in Sind.	District Supervisor, Economic Enquiry into the cost of production of cotton in Sind.	Mr. G. T. Nagrani, B.Ag. (Bom.).	10th March, 1933.	Appointed by the Chief Agricultural Officer in Sind.	
4. Sugarcane Research Scheme for the Deccan, Padegaon.	Principal Agricultural Officer.	Rao Saheb B. P. Vagholkar, L.Ag. (Bom.).	6th June, 1932.	Deputed from the Bombay Agricultural Department.	
	Crop Physiologist	Dr. R. D. Rege, M.Sc., (Bom.), Ph. D. (Lond.).	6th July, 1932	Recruited through the Board of Selection appointed by the Government of Bombay.	
	Soil Physiologist	Dr. J. K. Basu, M.Sc. (Cal.), Ph. D. (Lond.).	18th June, 1932.	Do.	
	Agricultural Overseer.	Mr. V. N. Apte, B.Ag. (Bom.).	18th December, 1931.	Deputed from the Bombay Agricultural Department.	
	Do.	Mr. N. B. Patwardhan, B.Ag. (Bom.).	1st March, 1932.	Do.	
	Do.	Mr. P. S. Kulkarni, B.Ag. (Bom.).	15th October, 1932.	Do.	
	Do.	Mr. P. V. Wagle, M.Ag. (Bom.)	1st March, 1932.	Do.	

	Do.	Mr. B. H. Ghaitkar, M.Ag. (Bom.).	6th February, 1932.	Do.
	Do.	Mr. S. S. Sirur, B.Ag. (Bom.)	6th August, 1932.	Transferred from the scheme financed from the funds of the Indian Central Cotton Committee.
	Do.	Mr. V. D. Tagare, B.Ag. (Bom.), B.Sc. (Bom.).	13th August, 1932.	Recruited by the Director of Agriculture, Bombay Presidency.
5. Scheme for an Economic Enquiry into the cost of production of crops in the principal sugarcane and cotton tracts of India.	Provincial Officer in Charge, Economic Enquiry, Bombay, Poona.	Mr. T. B. Pawar, B.Ag. (Bom.).	1st April, 1933 .	Deputed from the Bombay Agricultural Department.
	District Supervisor.	Mr. S. T. Purandara, B.Ag. (Bom.).	3rd April, 1933	Recruited by the Director of Agriculture, Bombay Presidency.
	Do.	Mr. S. F. Chandrannavar, B.Ag. (Bom.).	3rd April, 1933 .	Do.
	Do.	Mr. P. R. Patil, B.Ag. (Bom.).	3rd April, 1933 .	Do.
	Do.	Mr. D. A. Patel, B.Ag. (Bom.).	3rd April, 1933 .	Do.
6. Dry Farming Research Scheme.	Chief Investigator, Dry Farming Research Scheme, Sholapur.	Mr. N. V. Kanitkar, M.Ag., B.Sc.	1st October, 1933.	Deputed from the Bombay Agricultural Department.

APPENDIX XI—*contd.*

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed.	Remarks.
Main-centre, Sholapur	Assistant Investigator, Dry Farming Research Scheme in Charge of Soil Section.	Dr. J. A. Daji, M.Ag., B.Sc.	1st October, 1933.	Deputed from the Bombay Agricultural Department.	
	Senior Assistant in Charge of Plant Section.	Mr. R. B. Gode, M.Sc.	18th October, 1933.	Transferred from the scheme financed from the funds of the Indian Central Cotton Committee.	
	Superintendent, Dry Farming Research Scheme, Main-centre.	Mr. G. M. Bapat, M.Ag.	1st October, 1933.	Deputed from the Bombay Agricultural Department.	
	Senior Assistant in Plant Section.	Mr. D. H. Gokhale, M.Ag.	12th October, 1933.	Recruited by the Director of Agriculture, Bombay Presidency.	
	Junior Assistant in Soil Section.	Mr. Y. S. Rane, B.Ag.	1st October, 1933.	Do.	
Sub-centre at Bijapur	Superintendent, Dry Farming Research Scheme, Sub-centre, Bijapur.	Mr. K. D. Gomaste, B.Ag.	1st October, 1933.	Deputed from the Bombay Agricultural Department.	
	Junior Assistant at Bijapur.	Mr. G. B. Badami, B.Ag.	2nd October, 1933.	Recruited by the Director of Agriculture, Bombay Presidency.	

7. *The Cold Storage Research Scheme.*	Senior Research Assistant.	Dr. D. V. Karmarkar, M.Sc. (Bom.), Ph. D. (Bristol), A.I.I.Sc.	1st March, 1934.	Do.
	Junior Research Assistant.	Mr. B. M. Joshi, M.Sc.	1st March, 1934	Deputed from the Bombay Agricultural Department.
	Senior Mechanic	Mr. C. L. Barve, B. E. (Mech.).	1st March, 1934	Recruited by the Director of Agriculture, Bombay Presidency.
BENGAL.				
1. Rice Research Scheme.	Rice Research Officer	Babu Suresh Chandra Chakravarty, B.Sc., L.Ag.	1st June, 1932 .	Promoted from Department.
	Do.	Babu Kshitis Chandra Banerjee, B.A., L.Ag.	1st June 1932 .	Do.
	Assistant . . .	Babu Jnan Ranjan Pal, B.Ag.	1st June 1932 .	Recruited by the Department.
	Do.	Mr. E. A. R. Banerjee, M.Sc.	9th December, 1932.	Do.
2. Animal Nutrition Scheme.	Physiological Chemist.	Babu Indu Bhusan Chatterjee, L.Ag.	2nd January, 1932.	Promoted from the Department.
	Assistant Chemist .	Mr. Md. Abdul Hai, M.Sc.	2nd January, 1932.	Recruited by the Department.
3. Scheme for Physical and Chemical Research into soils.	Physical Assistant .	Babu Manindra Nath Chakladar, M.Sc.	1st June, 1932 .	Recruited through Public Service Commission (India).
4. Scheme for establishing sugarcane seedling testing station in Bengal.	Field Assistant . .	Maulvi Waziuddin Ahmed, L.Ag.	13th November, 1931.	Promoted from the Department.
5. Horticultural Scheme in Bengal.	Horticultural Officer .	Mr. V. N. Vadhawkar, B.Ag.	9th April, 1934.	Recruited through the Public Service Commission (India).

APPENDIX XI—*contd.*

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed.	Remarks.
6. Scheme for economic enquiry into the cost of production of crops of the principal sugarcane and cotton tracts in India.	District Supervisor	Babu Nihar Kumar Gupta, L.Ag.	5th November, 1934.	Promoted from the Department.	
	Investigator	Babu Santi Priya Bose, B.Sc. (Edin.).	11th September 1933.		
UNITED PROVINCES.					
1. Rice Research Scheme at Nagina.	Assistant Paddy Specialist.	Dr. B. L. Sethi, M.Sc., Ph.D. (Aberystwyth).	13th April, 1932.	Recruited through a Selection Board.	
	Farm Superintendent	B. Sanjai Singh (2-year course, Agri. College).	1st March, 1935	Promoted from the Department.	
	Research Assistant	Mr. T. R. Mehta, B.Sc. (Pusa trained).	1st March, 1932	Direct appointment.	
	Do.	Mr. Sultan Singh, L.Ag., B.Sc. (Reading).	15th July, 1933	Promoted from the Department.	
2. Scheme for an economic enquiry into the cost of cultivation of crops in the principal sugarcane and cotton tracts.	Supervisor	B. Kunai Singh, B.Sc. (Agri.).	9th February, 1935.	Direct appointment.	
	Do.	B. Budhi Prakash, M.A.	1st May, 1933	Do.	
	Do.	B. Kedar Singh, Member, Subordinate Agricultural Service.	13th March, 1934.	Promoted from the Department.	

3. Research into the development of the fruit industry in the hills in U. P.	Soil Chemist . .	Dr. R. S. Gupta, M.Sc., Ph.D., A.I.C.	10th July, 1934	Recruited through the Public Service Commission (India).	
	Horticulturist . .	Mr. R. S. Singh, B.Sc. (Reading), L.Ag.	10th July, 1934.	Do.	
	Mycologist . .	Mr. Udai Bhan Singh, M.Sc.	10th July, 1934	Do.	
	Entomologist . .	Mr. Ram Narain Singh, L.Ag.	10th July, 1934	Do.	
	Assistant Entomologist	Mr. G. D. Bhat, B.Ag. .	10th July, 1934	Direct appointment.	
4. Investigation into the problem of the sugar industry in the U. P.	Cane Physiologist .	Dr. R. N. Mathur, M.Sc., Ph.D. (Agri.).	15th January, 1934..	Do.	
	Chemical Assistant .	Mr. Khazan Singh, B.Sc. (Agri.), M.Sc.	15th January, 1934.	Promoted from the Department.	
	Research Assistant .	Mr. D. C. Agarwal, L.Ag. (post-graduate training, Pusa).	15th January, 1934.	Do.	
	Entomologist . .	Mr. B. D. Gupta, M.Sc. .	15th January, 1934.	Direct appointment.	
	Cane Agronomist .	Mr. Imdad Ali Khan, B.Sc. (Agri.), (Punjab).	14th December, 1934.	Recruited through Public Service Commission (India).	
5. Dr. A. E. Slater's scheme of improvement of goats.	Assistant . . .	B. Sardar Singh Bhatia, I.D.D.	15th October, 1931.	Appointed by Dr. Slater.	
6. Appointment of Veterinary Investigation Officer in the United Provinces.	Veterinary Investigation Officer.	Mr. Harsh Bahadur Shahi, M.Sc., M.R.C.V.S., D.T.V.M.	4th April, 1933.	Direct appointment .	Was a state veterinary scholar of the United Provinces Government in the United Kingdom prior to his appointment as Veterinary nvestigation Officer.

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed.	Remarks.
HARCOURT BUTLER TECHNOLOGICAL INSTITUTE, CAWNPORE.					
1. Grant to Harcourt Butler Technological Institute, United Provinces, for the provision of an experimental sugar plant.	Lecturer in Sugar Technology.	Mr. Abdul Rahim Khan, Dip. in Sugar Manufacture, R.T.C. (Glasgow).	23rd May, 1928.	Appointed by the Department.	1. The Imperial Council of Agricultural Research gives a grant of Rs. 20,000 per annum for the maintenance of the Sugar Factory. The pay of the staff is met from the budget of United Provinces Government.
	Assistant Research Chemist.	Dr. H. D. Sen, M.Sc., Ph.D. (London).	13th November, 1916, and to the department, 16th January, 1922.	Do.	
	Do.	Mr. H. S. Chaturvedi, B.Sc., Dip. holder of H. B. T. I.	23rd May, 1925	Do.	2. The grant to the Oil Section of the Institute is Rs. 30,000 for 1935-36 to maintain and run the Oil Section. The deficit of pay of the staff and other contingent charges are met from the budget of the United Provinces Government.
	Temporary Assistant in the Sugar Factory.	Mr. K. C. Joshi, B.Sc., Dip. holder of H.B.T.I.	7th March, 1933.	Do.	
	Offg. Workshop Superintendent.	Mr. Dhanpal Chandra, Dip. Mech. & Elec. Engg. (Roorkee), Dip. Mech. Engg. and Specialised in Cotton Spinning (Roor-	15th August, 1913.	Do.	

		kee) and in Cotton Spinning (City and Guilds London Instt.).			3. The Workshop Superintendent looks after the engineering work of both the sections.
2. Grant to Harcourt Butler Technological Institute, United Provinces to maintain and run the Oil Section.	Head of the Oil Chemistry Section.	Mr. J. A. H. Duke .	30th October, 1922.	Do.	
	Lecturer in Oil Technology.	Mr. D. Y. Athawale, M.Sc.	24th September, 1934.	Do.	
	Assistant Research Chemist.	Dr. N. G. Chatterji, D.Sc., D.I.C., A.I.C., A.M.I. Chem. E., LL.B.	10th October 1919, and to the department, 15th March, 1921.	Do.	
	Do.	Mr. H. M. Mulany, M.Sc. .	3rd February 1922.	Do.	
PUNJAB.					
1. Sugarcane Research Scheme.	Sugarcane Specialist .	S. Harbans Singh, B.Sc. (Agri.) (Punjab).	11th November, 1934.	Promoted from the Department on the recommendations of the Public Service Commission.	
	Agricultural Assistant, A. Class.	Bh. Balwant Singh Butter, B.Sc! (Agri.).	24th January, 1934.	Appointed by Director of Agriculture, Punjab, who is competent to make the appointment.	
	Do.	Bh. Atam Singh Kochhar, B.Sc. (Agri.).	1st February, 1934.	Do.	
	Do.	Bh. Dalbir Singh, B.Sc. (Agri.).	1st February, 1934.	Do	

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed.	Remarks.
1. Sugarcane Research Scheme—*contd.*	Agricultural Assistant, A. Class.	Bh. Sardul Singh, B.Sc. (Agri.).	1st February, 1934.	Appointed by Director of Agriculture, Punjab, who is competent to make the appointment.	
	Do.	M. Abdul Latif, B.Sc. (Agri.).	1st August, 1934.	Do.	
2. Locust Research Scheme.	Do.	Mr. C. B. Mathur, M.Sc. (Zoology), Lucknow University.	2nd January, 1931.	Do.	
	Do.	M. Abdul Haq, B.Sc. (Agri.)	9th August, 1933	Do.	
3. *Cost of Cotton Crop Production Enquiry.	Do.	M. Niaz Mohammad, B.Sc. (Agri.).	1st April, 1933	Do.	*The scheme is partly paid by the Imperial Council of Agricultural Research.
	Do.	Bh. Gurbachan Singh, B.Sc. (Agri.).	23rd October, 1933.	Do.	

	Do.	Bh. Gurcharan Singh Sohi, B.Sc. (Agri.).	1st August, 1934	Do.
4. Fruit and Vegetable Preservation Scheme.	Research Assistant .	Dr. Girdhari Lal . .	8th November, 1934.	Do.
5. Scheme for Improvement of Marketing in India.	Assistant Marketing Officer (Fruit).	S. Pritam Singh Diol, M.Sc. (Agri.) Mich. (U. S. A.).	15th March, 1935	Promoted from the Department by the Punjab Government.
	Assistant Marketing Officer (Livestock).	L. Harjas Rai, L. V. P. (Punjab).	15th March, 1935.	Do.
6. Appointment of a Veterinary Investigation Officer in the Punjab.	Veterinary Investigation Officer.	Mr. S. M. Sarwar, M.R.C. V. S.	1st October, 1932.	Selected by Director, Veterinary Services, Punjab, from amongst officers serving in the Civil Veterinary Department and selection approved by the Imperial Council of Agricultural Research on the recommendations of the Punjab Government.
7. Parasitological Research to be undertaken at the Punjab Veterinary College, Lahore.	Veterinary Assistant .	L. Karam Chand, L.V.P. .	16th July, 1934	Selected by the Director, Veterinary Services, Punjab, on the recommendations of the Principal, Punjab Veterinary College, Lahore, out of the L.V.Ps., of the 1934 session.

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed.	Remarks.
BURMA.					
Rice Research Scheme	Rice Research Officer	Mr. J. W. Grant, M.A., B.Sc., I.A.S.	10th December, 1932.	Promoted from the Burma Agricultural Department.	
	Assistant Rice Research Officer.	Mr. R. M. Row, B.A., M.Sc. (London).	6th February, 1935.	Through the Public Service Commission.	
	Senior Agricultural Assistant.	U Thein Aung, Diploma in Agriculture.	6th July, 1932.	Promoted from the Burma Agricultural Department.	
Marketing Scheme .	Marketing Officer .	Mr. F. D. Odell, M.A., I.A.S.	1st February, 1935.	Do.	
	Assistant Marketing Officer.	U Khin, B.Sc. (Horticulture).	1st February, 1935.	Direct appointment.	
	Do. .	U Hpu, Diploma in Agriculture.	8th February, 1935.	Promoted from the Burma Agricultural Department.	
	Do. .	U Kyin Sein, Diploma in Agriculture.	8th February, 1935.	Do.	
BIHAR AND ORISSA.					
1. Rice Research Scheme. (Sanctioned for 5 years from the 20th January 1932.)	Rice Specialist .	Mr. M. Mahbub Alam, M.Sc. (Lucknow).	20th January 1932.	Deputed from the Bihar and Orissa Agricultural Department.	Economic Botanist deputed to work as Rice Specialist, from the 20th January 1932.
	Assistant Botanist .	Mr. A. Rashid Akhtar, M.Sc. (Punjab).	2nd April 1932.	Appointed by Local Government.	
	Do. .	Mr. Awadh Bihari Saran, M.Sc. (Agra).	16th September 1932.	Do.	

	Senior Research Assistant.	Mr. P. D. Dixit, M.Sc. (Lucknow).	1st February 1932.	Appointed by the Director of Agriculture, Bihar and Orissa.
	Do.	Mr. R. A. P. Trivedi, M.Sc. (Benares Hindu University).	5th December 1932.	Do.
	Junior Research Assistant.	Mr. M. Anwarul Aziz Khan, B.Sc. (Agra).	20th February 1934.	Do.
	Do.	Mr. N. P. Chaudhury, M.Sc. (Lucknow).	3rd January 1933.	Do.
2. Sugarcane Research Scheme (Sanctioned for 5 years from 18th March 1932).	Sugarcane Specialist	Mr. K. L. Khanna, B.Sc., (Agri.) (Punjab).	18th March 1932.	Recruited through Public Service Commission (India).
	Physiological Assistant.	Mr. P. C. Rahija, M.Sc. (Agri.) (Punjab).	17th December 1933.	Do.
Do.	Chemical Assistant	Mr. Sailesh Chandra Sen, M.Sc.	23rd December 1933.	Do.
Do.	Botanical Assistant	Mr. Rama Rao Panje, M.A. (Madras).	2nd January 1934.	Do.
3. Fruit Research Scheme. (Sanctioned for 5 years from the 3rd April 1934).	Horticulturist.	Mr. K. C. Naik, B. Ag. (Bombay) M.Sc. (Bristol).	3rd April 1934	Do.
Do.	Botanical Assistant	Miss Rajul Shah, B. Ag. (Bomb.), M.Sc. (Mich., U. S. A.).	22nd February 1935.	Appointed by the Director of Agriculture with the consultation of the provincial Selection Board.

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed.	Remarks.
3. Fruit Research Scheme (sanctioned for 5 years from the 3rd April 1934).	Biochemical Assistant	Mr. Sheo Nath Prasad, M.Sc.	13th March 1935.	Appointed by the Director of Agriculture with the consultation of the Provincial Selection Board.	
4. Sugarcane Enquiry Scheme (Sanctioned for 3½ years from the 15th August 1935).	Supervisor . .	Mr. Promode Ranjan Hansdah Acharjee, M.A., B.Sc. (Michigan).	15th August 1933.	Appointed by the Director of Agriculture, Bihar and Orissa.	
	Do. . .	Mr. Krishnadeo Prasad .	1st April 1935 .	Do.	
5. Scheme of investigation on the possibilities of manufacturing 'Khandsari' sugar by the single pan method. (Sanctioned for 3 years from the 2nd January 1935).	Graduate Assistant .	Mr. Thakur Prasad, M.Sc.	2nd January 1935.	Do.	
6. Marketing Scheme, Bihar and Orissa (Sanctioned for 5 years from the 13th March 1935).	Senior Marketing Officer. .	Mr. B. N. Sarkar, L.Ag. (Sabour).	13th March 1935.	Appointed by local Government.	(*a*) Deputy Director of Agriculture, deputed to work as Senior Marketing Officer. (*b*) Paid by the Government of Bihar and Orissa.

1. Scheme for the improvement of rice cultivation in the Central Provinces.	Bio-Chemist . .	Dr. B. K. Mukerjee, Ph.D., D.Sc.	9th September 1932.	Recruited through the Public Service Commission (India).
	Botanist . . .	Mr. B. B. Dave, L.Ag. .	1st September 1932.	Selected from the Department by the Public Service Commission.
	Assistant . . .	R. G. Joglekar, B.Ag. .	18th November 1932.	Recruited locally.
	Do. . . .	S. L. Vishnoi, B.Ag. .	23rd June 1933.	Do.
2. Scheme for an Economic Enquiry into the cost of production of cotton crop.	Provincial Officer .	P. D. Nair, M.A., L.Ag. (Hon.) (Post Graduate, Pusa).	1st May 1933 .	Promoted from the Department.
	District Supervisor .	B. G. Khandekar, B.Ag. .	29th May 1933.	Do.
	Do. .	K. R. Dube, B.Ag. . .	29th May 1935	Recruited locally.
	Do. .	D. R. Dhodapkar, M.Sc., B.Ag.	8th January 1934.	
3. Scheme for the improvement of Marketing in India.	Assistant Marketing Officer.	G. D. Mehta, B.Ag. . .	11th February 1935.	Promoted from the Department.
	Do.	A. X. Rebello, B.Ag. .	5th February 1935.	
	Do.	N. S. Pathak, G.B.V.C. .	2nd February 1935.	Promoted from the Veterinary Department.
4. Investigation of animal diseases in the Province.	Veterinary Investigation Officer.	Mr. Bachan Singh, M.R. C.V.S.	20th June 1932	Recruited through the Public Service Commission.
5. Vaccination of cattle against rinderpest.	Senior Veterinary Assistant Surgeon.	Mr. G. D. Pani, G.M.V.O. .	15th March 1935.	Appointed from the Department.
	Veterinary Assistant Surgeon.	Mr. P. S. Nair, G.V.Sc. .	15th March 1935.	Fresh Appointment.
	Do.	Mr. C. G. Kurian, G.V.Sc. .	15th March 1935.	Do.
	Do.	Mr. S. B. Balkrishna, G.M.V.C.	15th March 1935.	Do.
	Do.	Mr. N. Hanumanth Rao, G.M.V.C.	15th March 1935.	Do.
	Do.	Mr. V. Srinivasan, B.A., G.M.V.C.	15th March 1935.	Do.

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed.	Remarks.
5. Vaccination of cattle against rinderpest, (*contd.*).	Veterinary Assistant Surgeon.	Mr. S. R. Nadgir, L.V.P. .	15th March 1935.	Fresh appointment.	
	Do. .	Mr. Raghunath Prasad G.B. & O.V.C.	15th March 1935.	Do.	
	Do. .	Mr. Ram Deni Prasad, G.B. & O.V.C.	15th March 1935.	Do.	
	Do. .	Mr. B. N. Swamy, G.B. V.C.	21st March 1935.	Do.	
	Do. .	Mr. A. Subbarao, G.M.V.C.	21st March 1935.	Do.	
ASSAM.					
1. Investigation of animal diseases in Assam.	Veterinary Investigation Officer, Assam.	Pandit Gajanan Pande, M.Sc., M.R.C.V.S.	26th April 1933	Recruited through the Public Service Commission.	
2. Sugarcane Research Scheme, Jorhat.	Chemical Assistant .	Babu Hemendra Nath Pal, M.Sc. (Chemistry).	3rd October 1933.	Appointed by the Director of Agriculture.	
3. Deep Water Paddy Farm, Habiganj, Sylhet.	Economic Botanist .	Mr. S. Majid, B.Sc. . .	13th September 1934.	Recruited locally.	
	Botanical Assistant .	Babu Sashindra Chandra Bhattacharji, B. Ag.	24th October 1934.	Transferred from General Cadre.	
NORTH WEST FRONTIER PROVINCE.					
Improvement of marketing in the North West Frontier Province.	Assistant Marketing Officer.	Mr. Sapra, B.A. (Economics).	1st May 1935 .	Direct appointment.	
	Do. .	Sarfraz Khan, B.A. (Economics).	1st May 1935 .	Do.	

HYDERABAD STATE.				
Scheme for an Economic Enquiry into the cost of production of crops.	District Supervisor .	Mr. V. K. Joshi, B.Ag. .	15th April 1933.	Fresh appointment.
Dry Farming Research Scheme.	Senior Assistant .	Mr. P. K. Savanur, B.Ag. .	4th July 1934 .	Promoted from the Department.
MYSORE STATE.				
1. Scheme for the Investigation of Fish Poisons and other Indian Forest Products.	Assistant Entomologist.	Mr. M. Puttarudriah, B.Sc. (Hons.).	20th December 1934.	
	Assistant Chemist .	Mr. K. Lakshminarayana Bhatta, B.Sc.	20th December 1934.	
2. Sugarcane Research Scheme (Breeding of Thick Canes).	Senior Assistant Botanist.	Dr. L. S. Dorasami, B.Sc. (Hons.), M.Sc. (Lond.), Ph.D. (Lond.)	1st February 1933.	
	Junior Assistant Botanist.	Mr. M. L. Subbanna, B.Sc. (Hons.).	1st February 1933.	
3. Investigation of Johne's Disease Research Scheme.	Veterinary Inspector .	Mr. K. Srinivasa Murthy, B.Sc., L.V.P.	21st January 1935.	
4. Economic Enquiry into the cost of production in the principal sugarcane and cotton growing tracts in India.	District Supervisor .	Mr. C. V. Krishna Murthi .	1st April 1933 .	
BARODA STATE.				
Economic enquiry into the cost of production of crops in the principal sugarcane and cotton tracts.	District Supervisor .	Mr. Manilal Harinarayan Jani, B.Ag., N.D.D., B.Sc. (Hons.) (Edin).	1st April 1933 .	Appointed from the Department.

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed.	Remarks.
CALCUTTA UNIVERSITY.					
Properties of Colloid Soil Constituents.	Research Assistant .	Mr. Ramprasad Mitra, M.Sc.	1st February 1933.	Direct appointment .	
DACCA UNIVERSITY.					
1. Dacca University scheme of research on the mechanical analysis of lateritic soils and on the nutrition of the rice plant.	Senior Assistant .	Mr. P. K. De, M.Sc., A.I.I.Sc.	11th August 1930.	Appointed through a Selection Board.	
	Junior Assistant .	Mr. J. N. Chakravarty, M.Sc., Post Graduate Diploma, Pusa.	11th August 1930.	Do.	
	Laboratory Assistant .	Mr. P. B. Bhattacharya, M.Sc.	1st December 1933.	Do.	
		*Mr. K. P. Ganguli, M.Sc.	1st October 1934.	Do.	* Appointed *vice* Mr. P. B. Bhattacharya granted leave without pay for 9 months from 1st October 1934.
2. Scheme for investigation on organic constituents of Indian soils.	Research Assistant in Agricultural Chemistry.	Dr. A. C. Bose, Ph.D., A.I.C.	12th November 1934.	Do.	
AGRA UNIVERSITY.					
1. Investigation on "Cereal Rusts".	Research Assistant .	Mr. Raghubir Prasad Gupta, M.Sc. (Agra), Botany with special paper on parasitic Basidiomycetes (including rusts).	1st April 1935.		

Do.	.	Mr. Shyama Lal Sharma, M.Sc. (Agra.) — Botany with special paper on parasitic Basidiomycetes (including rusts).	1st April 1935.
Do.	.	Mr. H. L. Gulati, B.Sc. (Pass) (Punjab) — Botany, B. Sc. (Hons.) Sch., M.Sc. (Hons. Sch.) (Punjab)—Botany.	1st April 1935.
Junior Research Assistant.		Mr. Ram Piyara Mal, B.Sc. (Ag.), (Lyallpur).	1st April 1935.

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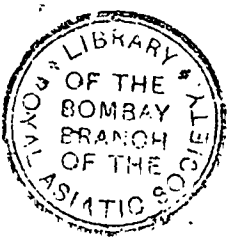

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Imperial Book Depot and Press, near Jama Masjid, (Machhliwalan), Delhi.
Indian Army Book Depot, Dayalbagh, Agra.
Indian Army Book Depot, Jullundur City and Daryaganj, Delhi.
Indian Book Shop, Benares City.
Indian School Supply Depot, Central Avenue, South, P. O. Dharamtola, Calcutta.
Insurance Publicity Co., Ltd., Lahore.
International Book Service, Poona 4.
Jaina & Bros., Mori Gate, Delhi, and Connaught Place, New Delhi, Messrs. J. M.
James Murray & Co., 12, Govt. Place, Calcutta (for Meteorological publications only).
Kali Charan & Co., Municipal Market, Calcutta.
Kamala Book Depot, 15, College Square, Calcutta.
Kamala Book Stores, Bankipore, Patna.
Karnataka Publishing House, Bangalore City.
Keale & Co., Karachi.
Krishnaswami & Co., Teppakulam P. O., Trichinopoly Fort, Messrs. S.
Lahiri & Co., Calcutta, Messrs. S. K.
Law Printing House, 11, Mount Road, Madras.
Law Publishing Co., Mylapore, Madras.
Lawrence and Mayo, Ltd., Bombay (for Meteorological publications only).
Local Self-Govt. Institute, Bombay.
London Book Co. (India), Arbab Road, Peshawar, Murree, Nowshera and Rawalpindi.
London Book Depot, B. I. Bazar, Bareilly, U. P.
Malhotra & Co., Post Box No. 94, Lahore, Messrs. U. P.
Modern Book Depot, Bazar Road, Sialkot Cantonment.
Mohanlal Dossabhai Shah, Rajkot.
Motilal Banarsi Das, Oriental Book sellers, Saidmitha Street, Lahore.
Nandkishore & Bros., Chowk, Benares City.
Natesan & Co., Publishers, George Town, Madras Messrs. G. A.
New Book Co., "Kitab Mahal", 192, Hornby Road, Bombay
Newman & Co., Ltd., Calcutta, Messrs. W.
North India Christian Tract and Book Society, 18, Clive Road, Allahabad.
Oriental Book Supplying Agency, 15, Shukrawar, Poona City.
Oxford Book and Stationery Company, Delhi, Lahore, Simla, Meerut and Calcutta.
Parikh & Co., Baroda, Messrs. B.
Pioneer Book Supply Co., 20, Shib Narayan Das Lane, Calcutta and 219, Cloth Market, Delhi.
Popular Book Depot, Grant Road, Bombay.
Punjab Religious Book Society, Lahore.
Raghunath Prasad & Sons, Patna City.
Rama Krishna & Sons, Booksellers, Anarkali, Lahore.
Ram Krishna Bros., Opposite Bishrambag, Poona City.
Ram Narain Lal, Katra, Allahabad.
Ramesh Book Depot, Stationery Mart, Kashmere Gate, Delhi.
Ray & Sons, 43, K. & L. Edwardes Road, Rawalpindi, Murree and Peshawar, Messrs. J.
Ray Chowdhury & Co., 119, Ashutosh Mukherjee Road, Bhowanipur, Calcutta.
Rochouse & Sons, Madras.
Roy Chowdhury & Co., 11, College Square, Calcutta, Messrs. N. M.
Sampson William & Co., 127-B., The Mall, Cawnpore.
Sarcar & Sons, 15, College Square, Calcutta, Messrs. M. C.
Sarkar & Co., Ltd., 18, Shama Charan De Street, and 8/2, Hastings Street, Calcutta, Messrs. P. C.
Scientific Publishing Co., 9, Taltola Lane, Calcutta.
Seshachalam & Co., Masulipatam, Messrs. M.
Shivji & Co., P. O. Chauliaganj, Cuttack.
Shri Shankar Karnataka Pustaka Bhandara, Malamuddi, Dharwar.
S. P. Bookstall, 21, Budhwar, Poona.
Standard Bookstall, Karachi.
Standard Book Depot, Lahore, Dalhousie and Delhi.
Standard Law Book Society, 5, Hastings Street, Calcutta.
Standard Literature Company, Ltd., Calcutta.
Students' Popular Depot, Kacheri Rd., Lahore.
Surat and District Trading Society, Surat.
Tasaporevala Sons & Co., Bombay, Messrs. D. B.
Thacker & Co., Ltd., Bombay.
Thacker, Spink & Co., Ltd., Calcutta.
Tripathi & Co., Booksellers, Princes Street Kalbadevi Road, Bombay, Messrs. N. M.
Union Stores, Indore City.
University Book Agency, Kachari Road, Lahore.
Upper India Publishing House, Ltd., Literature Palace, Aminuddaula Park, Lucknow.
Varadachary & Co., Madras, Messrs. P.
Venkatasubban, A., Law Bookseller, Vellore.
Wheeler & Co., Allahabad, Calcutta and Bombay Messrs. A. H.
Young Man & Co., Ajmer and Egerton Road, Delhi.

*Agent for publications on Aviation only.

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APPENDICES I—XI.

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Annual Report of the Imperial Council of Agricultural Research for 1935-36.

1. *Personnel of the Council.*—Important changes in the personnel of the Imperial Council of Agricultural Research took place during the 12 months ending with 31st March 1936. The first Vice-Chairman of the Council—Diwan Bahadur Sir T. Vijayaraghavacharya—relinquished his charge after a tenure of 6 years on the 26th October 1935. The Governor General in Council has appointed him a member of the Governing Body of the Council which will thus retain the benefit of his knowledge and experience. Sir Bryce Burt was appointed as officiating Vice-Chairman, while his place as Agricultural Expert was taken by Dr. F. J. F. Shaw. The Animal Husbandry Expert, Colonel Olver, returned to the scene of his activities, after a period of four months' leave, on the 23rd December 1935 and relieved Mr. Ware, Director of the Imperial Institute of Veterinary Research, Muktesar, who had acted for him. The composition of the Governing Body, the Advisory Board and the Council's Secretariat at the close of the year is shown in Appendix I.

2. *Indian States.*—The Kashmir State was admitted as a constituent member of the Council and was granted representation on the Governing Body and Advisory Board of the Council. A donation of a lakh of rupees payable in instalments has been promised by the State. Hyderabad, Mysore, Baroda, Travancore, Cochin, Bhopal and Kashmir are now members of the Council. It is gratifying that the sphere of the Council's activities is thus being progressively extended throughout the country.

3. *Meetings of the Council.*—Two meetings of the Advisory Board and one of the Governing Body of the Council took place during the year. The Annual General Meeting of the Council was held on the 15th February 1936. At this meeting the Annual Report and the yearly report on the accounts of the Council were considered and passed.

4. *Finance.*—The following grants were received during the year from the Government of India :—

(*a*) Annual Grant for research work	Rs. 5 lakhs.
(*b*) Grant for sugar research work..	Rs. 2·50 lakhs.
(*c*) Grant for expenditure on provincial portion of the marketing scheme.	Rs. 2 lakhs.
	Rs. 9·50 lakhs.

On account of financial stringency the annual research grant of Rs. 5 lakhs was temporarily suspended in 1932-33, but the Government of India continued to allot the necessary amount by means of a supplementary grant towards the close of each financial year. It has now been decided that from 1936-37 a sum of Rs. 5 lakhs for Research will be provided annually in the budget estimates of the Department. The Government of India have also been pleased to make

a special grant of Rs. 21,36,476 for the Council's research programme. This grant includes a sum of Rs. 10 lakhs representing the balance of the block grant of Rs. 25 lakhs which was promised to the Imperial Council of Agricultural Research at the time of its establishment. These grants have made it possible to finance certain specially approved schemes of immediate and direct economic importance. A list of these schemes will be found in Appendix II.

5. *Scientific Stock-taking.*—The Council has been in existence for over six years and some of its research schemes have been in operation for some five years. Large sums of money have already been spent on the various research schemes and the orbit of the Council's activities has rapidly expanded during the period. With a view therefore to ascertain the progress already made and the lacunae still left in the Council's programme and also to determine the most profitable lines of future development in the way of research, both relating to agriculture proper and animal husbandry, it has been decided to carry out a scientific review of the Council's activities. To assist in this stock-taking operation it has been decided to requisition the services of two eminent scientists from England. One of these will be selected for his special knowledge of dairy science, the other for his acquaintance with the latest developments in the science of crop production. These gentlemen will have the assistance of two Indian officers as advisers and technical Secretaries. The Briefs for these experts will be approved by the Advisory Board of the Council which has already set up three small technical Committees for the purpose and the Board will discuss their reports in due course and make recommendations to the Governing Body.

6. *Tobacco Research.*—Reference was made in paragraph 10 of the previous report to the proposed Central Tobacco Sub-Station at Guntur in the Madras Presidency, grants to be made by the Council to several Provinces and Indian States for the erection of flue-curing barns and the carrying out of co-operative experiments. Arrangements for acquiring a site at Guntur are almost complete and the Sub-Station will be started during the course of the year 1936-37. Progress has been made with the provincial co-operative experiments. In the Punjab one barn is being erected at the Jullundur Agricultural Station where tobacco will be grown under well-irrigation and the other at Lyallpur where tobacco is a canal-irrigated-crop. In Bombay one standard barn will be erected at the Nadiad Farm for experiments parallel to those conducted in the other provinces and four acres of land are being provided by the local Government at the Farm for these experiments. The second barn will be erected at the Borsad Farm, or other suitable centre, after the results of work at the Nadiad Farm become available. In Bengal one barn will be erected at the Dacca Farm during the next season and the site for the other barn will be chosen after the results of the present season's crop are known.

The experimental work under this co-operative scheme will be arranged as follows :—

The investigations on the chemical changes which take place in the leaf (as a result of curing, bulking and storage), the control of weevils and the possibility of artificial maturation will be taken up in due course by the Imperial

Agricultural Research Institute and when necessary at the proposed Tobacco Sub-Station at Guntur. This Institute will also arrange for expert valuations of the leaf grown at the various co-operating centres. Certain experiments on the effect of environment on the chemical composition and quality of Indian grown cigarette tobacco will also be undertaken by the Imperial Institute of Agricultural Research and each co-operating centre will be expected to supply the Imperial Economic Botanist with the necessary tobacco leaf. It will be left to the discretion of each Agricultural Department to undertake still further provincial studies on the chemical composition of tobacco leaf produced on different soils and under different ecological conditions as may be necessary. For the co-operative experiments, seeds of standard types will be supplied free by the Imperial Agricultural Research Institute and details of the experimental work at each station will be settled in consultation with the Institute.

7. *An outline of the Council's activities on Animal health and Animal Husbandry.* —During the year under review the work of the Animal Husbandry Section of the Council was considerably expanded and action was taken on important matters which should lead, in the future, to very material improvement in the organisation and development of Animal Husbandry Research in India. The following may be particularly mentioned :—

(*i*) *Animal nutrition research Institute, Izatnagar.*—Government of India's sanction was obtained, at the instance of the Imperial Council of Agricultural Research, for the establishment of an enlarged Animal Nutrition Research Institute at Izatnagar, to work in collaboration with Provincial institutions, engaged in similar work, and with the Imperial Institute of Veterinary Research, Muktesar, in carrying out a systematic study of the feeding values of Indian food stuffs and of the effects of diet on the health and development of Live-stock of all kinds in India. The establishment of this Central Institute, for Animal Nutrition Research, should prove an important step in providing for the better care and management of live stock throughout India.

(*ii*) *Poultry Research Institute, Izatnagar.*—Sanction was given for a grant from the Imperial Council of Agricultural Research, for systematic research on poultry diseases, also at Izatnagar, which is a Sub-Station of the Imperial Institute of Veterinary Research, located on the outskirts of Bareilly. Government of India's sanction was also obtained for a separate grant for the establishment of a Poultry Research Institute at the same station; for research on the production and commercial exploitation of poultry and poultry products of all kinds and to provide healthy birds for the purposes of the poultry diseases Research Workers. The want of research on poultry in health as well as in disease is very much felt by poultry-men throughout India and the lack of it is at present a very serious deterrent to the taking up of poultry farming on modern lines. In present circumstances the work of years is constantly liable to be lost through fatal outbreaks of epizootic disease.

(*iii*) *Experimental creamery at Anand.*—Arrangements were completed during the year for the formation of a separate dairy section, to work immediately under the Education, Health and Lands Department, and sanction was obtained for a special Government of India grant, of Rs. 6 lakhs, to provide for an Experimental Creamery at Anand and for the enlargement of facilities

for dairy instruction and research at Bangalore. The provision of such facilities is very urgently needed to enable the Dairy department to undertake systematic research on the processing and handling of milk and milk products under Indian conditions and on the manufacture of by-products which is essential for the proper development of Dairying on scientific lines.

(*iv*) *A scheme for the official definition of breed characteristics.*—In this connection another scheme may be mentioned for which an Imperial Council of Agricultural Research grant was sanctioned during the year, *viz.*, a scheme for the official definition of breed characteristics of 7 of the most important dairy breeds of Indian dairy cattle and for the registration by the Animal Husbandry Bureau of approved stock of these breeds, with a view to their systematic development on the lines which have proved successful on certain Government Farms and in the Military Dairy Farms Department.

The publication by the Council of data concerning the marked improvement which has been effected at such farms, by the scientific breeding and management of indigenous dairy stock, has shown that in a comparatively few years high-yielding strains of certain indigenous Indian breeds have been evolved which are already able to hold their own, with the best imported cattle of European origin, in the economical production of standard milk and butter-fat under Indian conditions.

If systematically followed up by properly organised Animal Husbandry Departments in provinces and states, work along these lines should prove of the greatest economic and social importance to the country.

Under schemes financed by grants from the Council, the following matters were dealt with during the year :—

(*v*) *Animal Disease.*—(*a*) *Veterinary investigation in provinces and states.*—Disease investigation officers continued to carry on systematic investigation of stock diseases in all major provinces and some Indian States and further valuable results were obtained. Probably the most important matter dealt with during the year was the systematic testing in the field of Rinderpest control by means of goat virus which was mentioned in last year's report. These investigations have everywhere shown that control by the use of a tissue-vaccine, prepared from goats inoculated with the attenuated goat virus which has resulted from research at the Muktesar Institute, is a great advance in efficiency and economy over any methods of Rinderpest control previously available in this country.

Many lakhs of cattle, including large numbers of buffaloes, were vaccinated during the year, either with goat tissue-vaccine or with blood virus drawn from goats similarly infected, and the results have been uniformly successful, in controlling natural outbreaks and in conferring lasting immunity on cattle which had not been exposed to infection. The mortality following such vaccination, including already infected animals inoculated in the face of outbreaks, has amounted in the last two years to approximately 47 per 10,000 in the case of tissue, and 4 per 10,000 in the case of blood virus inoculations. Moreover the extremely low cost of this tissue vaccine may be gauged from the fact that as many as 2,500 doses can be obtained from a single goat while,

similarly 500 doses of blood virus can be obtained from a goat. Indeed the position has now been reached that, given the necessary subordinate staff to carry out systematic inoculation all over the country, Rinderpest could be controlled and the enormous losses which at present occur from this disease could almost entirely be obviated at relatively small expense.

The *ad hoc* committee which dealt with the reports of the Disease Investigation Officers, after reviewing the year's work, drew up an agreed schedule of the particular diseases each Disease Investigation Officer should concentrate upon and it was agreed that it would be advisable that, after completing 4 years, each should prepare a comprehensive survey of the work done during the whole period.

During the year a Disease Investigation Officer was appointed for work in the North-West Frontier Province and a scheme was approved for providing one for Sind.

(*b*) *Inoculation of cattle in the Central Provinces.*—In addition to similar work done in other provinces, large numbers of cattle, including buffaloes, have been inoculated in the Central Provinces. The work is being carried out, under carefully controlled conditions, by special staff, a grant for which was sanctioned by the Imperial Council of Agricultural Research, to investigate the proper application of goat blood-virus used in accordance with the method of controlling Rinderpest (by means of the Muktesar virus inoculated into locally purchased goats) which was introduced in that province by the late Major Stirling. This method is now being systematically tested alongside the tissue-virus method recommended by the Imperial Institute of Veterinary Research, Muktesar. In both cases the virus with which the goats are infected is the Muktesar fixed goat virus and valuable information has been obtained as to the comparative merits of inoculation with this virus, as contained in goat blood and in the Muktesar goat-tissue vaccine.

The results have been eminently satisfactory for the control of Rinderpest amongst indigenous Indian cattle but it appears that further investigation is necessary to ascertain the suitable dosage, of each of these vaccines, for the protection of buffaloes, in which animals, the re-action is apt to be variable and in some cases severe.

Observations are also being made as to the length of time necessary to secure satisfactory attenuation and fixation of virus, obtained from cattle in the course of a natural outbreak, by repeated passage through goats.

(*c*) *Investigation of Johnes disease among cattle in Mysore.*—The systematic investigation of Johnes disease among cattle in Mysore was taken up during the year, under a grant from the Imperial Council of Agricultural Research, with particular reference to the curative properties of certain derivatives of *Chaumoogra* oil and to endeavour to find a more satisfactory test than is at present available for the early detection of cases of this insidious disease.

(*d*) *All-India legislation for the control of disease amongst livestock.*—The draft all-India Act for the control of disease amongst livestock and rules thereunder was circulated to local Governments and Minor Administrations and is now under consideration with a view to being placed before the Legislative Assembly at the earliest opportunity.

(*v*) *Animal Nutrition.*—Mention was made in last year's report of the extension of research upon Animal Nutrition in Madras Presidency.

It has since been decided to concentrate all the work at Coimbatore, under the direction of the Agricultural Chemist, instead of at Coimbatore and Hosur as originally proposed. Work under the scheme was started from 1st April 1935.

The Annual Reports of the Bengal Animal Nutrition Research Scheme for the years 1931 to 1935 were considered by the Standing Animal Nutrition Committee of the Council and it was agreed that the work being done at Dacca, though it had extended beyond its original purpose, was valuable and extension of the scheme was recommended on a reduced scale in order to complete the original programme.

(*vii*) *Animal Industry.*—(*a*) *Goat Breeding.*—Mention was made, in the last report, of the remarks of the Cattle Breeding Committee of the Advisory Board on the reports of the Goat Breeding Scheme at the Mission Poultry Farm, Etah, recommending that the cost of producing a lb. of milk should be made available and suggesting that an attempt should be made to reduce the kidding interval of the goats maintained under this scheme. In the report for the year 1935-36 very considerable progress was shown in both these directions and an arrangement has been arrived at, with the Director, Civil Veterinary Department, United Provinces, for the rearing of male kids to maturity and for their utilization for breeding purposes within the province.

In connection with this scheme, a small grant has also been obtained, from the Rural Development Fund, for the holding of goat shows. Altogether 645 goats from 149 villages were exhibited and there is considerable demand from the United Provinces and other parts of India for the progeny of these improved goats, for breeding purposes.

The work on the manufacture of "soft" or "cottage" cheese, mentioned in last year's Report, was continued throughout the winter and it is proposed to extend this and to standardise and publish details of the method in the form of a pamphlet.

There has been a further steady increase in the average milk-yield of all the three types of indigenous goats bred at the Farm and it is noticeable that the best indigenous goats, and their cross-breds with local *desi* goats, are able to hold their own with the Toggenberg crosses, a few of which are still available. Since 1933 the average daily milk yield of the whole milking flock has increased from 1·9 lb. per diem to 2·5, while the number of days in milk has decreased from 269 to 167. During the year, the cost of production of a lb. of milk was reduced from 7·3 to 7·1 pies per lb. and there was a noticeable increase in the milk yields of daughters as compared with their mothers.

All the goats in the flock were tested with *Brucella* infection in October 1935, for the fourth time, and there were no reactions. It transpired that there is a steady and increasing demand for such goats from various parts of India and extension of the grant for a further 5 years was recommended.

During the year two further schemes of research on goat breeding were sanctioned by the Governing body, one from the Government of Bombay and one at the Agricultural Institute, Katpadi.

(*b*) *Dairying.*—Mention has already been made of the special grant which has been obtained to provide an Experimental Creamery and to extend the facilities for dairy instruction and research at the Imperial Institute of Dairying, Bangalore. In this connection a scholarship was granted to Mr. Varma, Assistant at the Imperial Institute of Dairying at Bangalore, for special study in England of the Marketing of milk and dairy products as well as the latest methods of manufacture of condensed and evaporated milk and cream, dried milk, casein, etc.

The original scheme for carrying on investigations at the old Anand Creamery on the processing and handling of milk, which was sanctioned in 1932 but not put into operation owing to financial and other difficulties, was reconsidered by the Governing Body and sanction has now been given for this work to be carried out at the new Creamery as soon as work commences there.

(*c*) *Poultry.*—In regard to the Poultry Institute, mentioned already, which it is proposed to establish at Izatnagar, it was agreed that its functions should be as follows :—

(*i*) To carry on research on disease, nutrition and genetics and to act as a bureau for the dissemination of the results of research on poultry in this and other institutions in India.

(*ii*) To carry on investigations on the processing and disposal of poultry and egg products.

(*iii*) To make arrangements at the Central Poultry Institute for courses of training if there should be a demand for them.

Two schemes, submitted by the Governments of Bombay and Punjab respectively, for research in the breeding and management of poultry, were approved.

(*d*) *Apiculture.*—The subject of apiculture in India was considered by a special *ad hoc* committee held during the year under review and it was agreed that the Imperial Council of Agricultural Research should select a man with suitable experience and qualifications and send him abroad for training in Bee-keeping, so that he could be employed by the Council to carry on research, at a Central Institute, on Bee-keeping and management in India, and to advise provincial Governments in the matter.

Three schemes for apiculture, submitted by the Governments of Bombay, Baroda and Mysore, were approved and a grant of Rs, 2,000 was made towards the training, in America and other countries, of an Assistant of the Agricultural Department, Punjab.

(*viii*) *Dairy Legislation.*—The subject of Dairy Legislation, to prevent adulteration and to assist in the development of the Dairy Industry in India, on sanitary lines, was discussed by a special Dairy Legislation Committee. Considerable information was obtained by visits of sub-committees to certain big cities, as to the present state of the industry, and it has been decided to

examine the existing legislation and municipal regulations with a view to obtain suitable modifications, where necessary. A special committee was also formed to consider the fixation of dairy standards and arrangements are in progress to get a series of chemical analyses carried out, with a view to arriving at a decision on suitable all-India standards for milk, cream, butter, ghee and other dairy products.

(*ix*) *Animal Husbandry Bureau.*—(*a*) The Animal Husbandry Bureau of the Council continued to function on the lines indicated in last year's report and its activities are steadily expanding. One notable item of work started during the year is the maintenance of an index of important articles on Animal Husbandry, as they appear in the scientific and other publications received by the Council from all over the world. This index should in time become of very great value to Animal Husbandry workers in India.

(*b*) Another important item of work, now nearing completion, is the arrangement which is being made for the publication at regular intervals of available records of milk yields in India. Owing to the increasing recognition that a certain proportion of Zebu blood is essential for the maintenance of constitution in tropical countries, enquiries are being received for information regarding the capacity of Indian dairy cattle for milk production, the results of cross breeding in India and on a variety of other matters. Apart therefore from its value to breeders of dairy cattle in India the publication of such data should help to build up an external trade in dairy cattle in India and indirectly should help materially towards breeding on scientific lines.

(*c*) Arrangements have been made for the collection from all parts of India of data relating to milk yields, feeding, milking period, dry period, and other data regarding dairy cattle and buffaloes maintained by *Gwálas* in towns and villages. These will be compiled and published in the course of the ensuing year. This investigation is expected to furnish much needed information regarding indigenous dairying in India, about which, at present, there is very little reliable information.

(*d*) Investigation, further to that reported last year, was proceeded with regarding the incidence and the economic loss caused by Abortion and Foot and Mouth disease.

(*e*) Steps were taken to obtain regularly from provinces figures relating to the slaughter in recognised slaughter houses, of different kinds of livestock and regarding inter-provincial trade in livestock.

(*f*) With the approval of the Cattle Breeding Committee and the Advisory Board a definite step has now been taken to convene meetings of *ad hoc* Committees, composed of official and private breeders of the best recognised breeds of dairy cattle, to define the breed characteristics of the most important dairy breeds of Indian Diary cattle. When these have been defined it is proposed to undertake the preparation of a *brochure* on the subject for the guidance of breeders in India and abroad to maintain all-India Herd Books for the registration of accredited stock of these breeds.

(*g*) The Bureau has collected much information regarding existing legislation in India, in relation to the adulteration of foods, the standards at present

prescribed for various dairy products. It has also studied the legislative enactments of other countries, notably United States of America, relating to the production and distribution of milk with a view to considering what action could be taken for the better control of the dairy trade in India.

(*h*) Statistical information was collected and enquiries answered from India and abroad in relation to a variety of subjects.

(*x*) *Award of gold and silver medals for improvements in the Science and Art of Agriculture and Animal Husbandry.*—In 1933 the Imperial Council of Agricultural Research invited entries for the award of Gold and Silver medals for improvements of distinctive merit in instruments and appliances used in veterinary science. Eight entries were received and examined by a special committee. The instruments were put to practical test and the results were again considered by an expert sub-committee in February 1936. In the end a Gold medal was awarded to Ch. Mushtaq Ahmad, Hospital Surgeon of the Punjab Veterinary College, for his appliances for the treatment of prolapse of the vagina and uterus of animals and of prolapsus recti.

(*xi*) *Animal Husbandry Research Workers' Conference.*—At an informal meeting held in July 1935, at which provincial Directors of Veterinary Services and the Director of Imperial Institute of Veterinary Research were present, it was agreed, in view of the lack of adequate accommodation at the Imperial Institute of Veterinary Research, Muktesar, that, if possible, a Research Workers' Conference should be held every second year, at Delhi or some other place suitable for holding such meetings during the winter season. This idea was afterwards developed so as to include workers on all branches of Animal Husbandry Research and the first Animal Husbandry Research Workers' Conference was accordingly organised during the year under review and met from the 17th to 19th February 1936. About 55 Research Workers in all branches of Animal Husbandry attended and an agenda of 20 items was discussed dealing with a wide range of Animal Husbandry subjects. Papers were read and full notes of the discussion will be published in due course.

8. *Technology of vegetable oils.*—Reference was made in paragraph 13 of the report for the year 1933-34 to the grant of Rs. 30,000 as temporary financial assistance to enable the United Provinces Government to continue the oil technology section of the Harcourt Butler Technological Institute at Cawnpore. This grant was continued during 1935-36. In return for this assistance, approximately half the accommodation in the different courses is made available to students of other provinces, free of tuition fees, nominations being made by the Council. Accordingly five nominees of the Council were admitted to the Diploma course in Vegetable Oil Technology in July 1934 and again in July 1935. Two short course candidates were also admitted in 1935 as nominees of the Council. The annual report of the Oil Section for the year 1934-35 shows that it continued to render assistance to the vegetable oil industry in the United Provinces and elsewhere in India and carried out the following experimental work :—

(*a*) An examination of the seeds crushed in Bengal, Bihar, the Punjab and the United Provinces under the name of mustard and rape seeds ;

(*b*) A study of the processes used for the bleaching of castor and mahua oils for technical use ; and

(*c*) The preparation of light coloured ester gums from rosin in an inactive atmosphere.

The report was considered by the Advisory Board and approved.

9. *Research Schemes—Agricultural.*—(*i*) *Soy beans.*—The question of extending the ryots' resources by the introduction of new crops has been receiving attention in the Punjab and the Oil-seeds Committee of the Council suggested that soy-beans might be a useful addition to local resources. Arrangements were made through the High Commissioner for India in London, for tests on experimental consignments of soy-beans from the Punjab in order to ascertain possibilities of a market in London for Indian-grown soy-beans. Suitable samples of four varieties, *viz.*, Pusa Chocolate, Pusa White, Manchurian and Punjab White, were accordingly despatched by the Director of Agriculture, Punjab, early in 1935. It was found that produce of the Pusa Chocolate type sent would be saleable in the United Kingdom as an oil seed but might not realise the full current price for Manchurian beans on account of its low protein content; the percentage of oil was normal and the oil prepared from the beans was of satisfactory quality, although its iodine value was rather higher than is usual for commercial soy-bean oil. The results of the examination of the other three varieties showed that commercial lots of those qualities should be readily saleable in the United Kingdom and that the Punjab grown Manchurian type might realise a slightly higher price than the other two as it possessed a higher oil and protein content.

(*ii*) *Rice Research.*—The plan and scope of this important group of research schemes which started in 1932-33, except in Assam where work commenced in 1934, have been stated in pervious reports. Briefly, the object is to fill the lacunae which existed hitherto, to ensure more adequate attention to the crop which covers 80 million acres annually, and to secure a better interchange of information and material between workers in the different parts of India. Progress reports for 1934-35 from all the research stations were received during the year. These were first examined by a technical sub-Committee of the Standing Rice Committee of the Council, at two meetings held in July 1935 and February 1936. The reports were generally approved and a number of suggestions in regard to future work were made ; these have been brought to the notice of all the research stations. Among the more general recommendations made by this sub-committee, the following may be mentioned :—

(*a*) Difficulties having arisen in the classification of varieties of rice by the colour character of the glumes, due to the wide variation shown by this character and the lack of uniformity in the different descriptive terms used by different authors, it has been arranged that the Paddy Specialist to the Government of Madras will write a note endeavouring to establish some degree of uniformity in the descriptive terms used for this character. This note will be circulated to other workers on paddy schemes for opinion.

(*b*) In all hulling trials, for which the ' maung ' device was considered the simplest and the best machine, it was decided that a standard variety of paddy should be included in in every trial to allow of effective comparison between types.

A brief statement of the work in progress at some of the research stations during 1934-35 is given below :—

Madras.—The scheme is in the third year of its working. It may be noted that the station will fall in the new province of Orissa. The major paddy work of the Madras Presidency is based on the Rice Research Station at Coimbatore and has been financed by the Local Government for many years. The evolution of desirable strains in the more important varieties of Ganjam and Vizagapatam Districts of the Presidency is an urgent necessity for the tract and much attention is therefore being paid to this aspect of the work. Hybridisation work for economic purposes as also for the study of inheritance of certain characters has been in progress since the second year. The ryots expressed great satisfaction with the mass-selected seed of the two major varieties, *Ratnachudi* and *Bayyahunda* distributed to them during the previous year.

United Provinces.—Satisfactory progress was made with the work at the Nagina Rice Research farm during 1934-35. The varieties produced at the station are already popular and are always in demand. With a view to meet the increased demand for seeds of improved varieties and to investigate the numerous problems of paddy culture the area under paddy at the farm has been increased by another ten acres. One important line of work is the detailed study of hybrids between the early enclosed *spathe* type *Sathi* and high quality rices the object being to combine immunity to damage by the Rice Bug (*Leptocorisa Varicoonis*) earliness, hardiness and quality. These hybrids were in the F.5 generation and immunity to damage by the Rice Bug had definitely been secured. Another series of crops was designed to provide a high-yielding good quality rice for the Sardar Canal tract. Hulling and cooking trials were carried out and will be continued. Cytological studies included chromosome counts and the chromosome morphology of different strains and a study of the behaviour of the chromosomes at meiosis. Properly randomised and replicated field trials were carried out with—(*a*) different manurial treatments, (*b*) time of application of manures, (*c*) water requirements when different fertilisers are used, (*d*) effect of manuring seed beds and of crowding seedlings in the seed-bed and (*e*) effect of age at transplantation on yield.

Burma.—The breeding, genetical and growth studies were continued. Other investigations included the study of exotic varieties received from America, Japan, Formosa, China, Egypt and Java, investigations into the effects of different methods of drying and storing, on quality and milling and investigations into the effects of soil and climatic conditions on the quality of rice. The report was approved and the technical sub-committee noted that two of the Ngasein hybrids had reached a stage at which it will be possible to carry out experiments in export on a small scale.

Bihar and Orissa.—The reports for 1933-34 and 1934-35 which were received during the year were considered to be satisfactory on the whole. On

the botanical side, the technical sub-committee drew special attention to the need for concentrating effort on the main lines and suggested that some subsidiary investigations could profitably be dropped.

Assam.—The deep water paddy research farm at Habibganj was opened in January 1934. A need has been felt for a number of years for special facilities for the detailed study of the long-stemmed *Aman* and *Horo* Rices. The work done during the first year was of a preliminary character and the rice research sub-committee has approved a detailed programme of investigations on deep water paddies.

(*iii*) *Professor Dastur's Scheme of rice Physiology.*—The Progress report on this scheme which has been completed, have been referred to in previous years. The principal results have been published in the Indian Journal of Agricultural Science and Agricultural Departments invited to consider the possibility of more extended field experiments under local conditions to test the conclusion that a mixture of ammonium sulphate and sodium nitrate is a better fertiliser for Rice than either constituent alone. The final report is awaited.

(*iv*) *Botanical Sub-Station, Karnal.*—Reference was made in paragraph 12 (*iii*) of the last year's report to the fact that the continuance of the Sub-Station for a further period of five years from October 1935 had been sanctioned. The quinquennial report for the period ending October 1935 will be considered at the next meeting of the Advisory Board.

With the transfer of the Imperial Agricultural Research Institute to New Delhi from the *rabi* season of 1936-37 the sub-station at Pusa, for work in North Eastern India, will come into operation.

(*v*) *Potato breeding and research.*—Reference was made in the last annual report [paragraph 12 (*iv*)] to the work done at the Nanjnad potato research station in the Madras Presidency during 1934-35. As a result of the examination of the progress report for that year it has been suggested to the local Government that all crosses should be planned with the definite object of producing disease-resistant and heavy yielding varieties of a commercial character. The report of the station for 1935-36 is awaited.

As regards the main scheme for potato-breeding in Northern India the preliminary co-operative experiments at the hill stations in the United Provinces, Punjab and Assam were completed during 1935. The results indicated that a wide range of potato varieties may be expected to flower and fruit satisfactorily both at Simla and Chaubattia, as well as at Katrain and Manali in the Kulu valley. As the last two stations were accessible only with difficulty the choice of a site for the hills portion of the scheme lay between Simla and Chaubattia. While the number of berries formed per plant was generally higher at Chaubattia than at Simla, the percentage of plants that formed berries was larger at the latter station. As land and other facilities were not easily available in Chaubattia it has been decided that the hill station should be located at Simla. Temporary arrangements have been made for 1936 so that the large amount of valuable material already collected and under study in 1935 may be utilised to the best advantage.

As stated in the previous report, as a temporary measure, potato breeding work was carried out during the summer of 1935 in the grounds of the Rust Research Laboratory at Simla. Considerable information has been collected on the behaviour and characteristics of several other species of *Solanum* received from America, Russia and Cambridge, on several strains of *Solanum tuberosum* and on a few inter-specific hybrids received from abroad.

(*vi*) *Agricultural meteorology.*—Satisfactory progress is being made with the work under this scheme. As stated last year, the Governing Body sanctioned the continuance of this scheme for the full period of five years. The third annual report on its working, for the year ended August 1935, has been received and will be dealt with by a Sub-Committee of the Advisory Board at its next session.

In view of the importance of Agricultural meteorology the Advisory Board in February 1936 recommended that steps should be taken to place research in this branch of science on a permanent basis.

(*vii*) *Investigations on cereal rusts.*—The extended scheme on the investigations on cereal rusts by Dr. K. C. Mehta came into operation from April 1935. A report of the work done up to the end of June 1935 showed that the progress made in completing the previous investigations and the fresh work undertaken in the extended scheme was satisfactory. Through the kind co-operation of the Government of Nepal, it was possible to make an intensive search for early appearances of Rust on wheat and barley from Tanakpur to Nautanwa *via* Silgarhi, Dailekh, Sallyana, Piuthan and Tansing.

The problem of Rust dissemination was further studied. The pathogenecity of all three physiologic forms of yellow Rust of wheat was tested on 70 hosts and the seedling resistance, in the greenhouse, of 48 hosts to four physiologic forms of Black Rust was also tested. Forty one hosts were tested with the two forms of Brown Rust.

The studies in the life histories of the Rusts were continued both at the Simla hill laboratory and at Agra during the winter. Dr. B. P. Pal, Second Economic Botanist started work on the breeding of wheats resistant to known physiologic forms of Rust. The Sub-Committee of the Advisory Board which examined the progress report emphasised the importance, when breeding rust resistant varieties, of adequate attention to the retention in any new varieties of desirable agricultural and economic qualities. The Committee also desired that adequate attention should be paid to the need of the Central Provinces, Bombay and certain other areas for short season wheats.

(*viii*) *Virus diseases of plants.*—A reference was made in the last year's report to Dr. Uppal's deputation to Europe to study recent methods. Certain modifications in the scheme were sanctioned by the Governing Body of the Council in September 1935 and funds are being allotted to it during 1936-37.

(*ix*) *Provincial Horticultural Research Schemes.*—The first annual progress reports on some of these schemes have been received.

BENGAL.

The Bengal scheme started from April 1934 at the Horticultural Station, Krishnagar and the first report deals mainly with preliminary matters. The

Sub-Committee of the Advisory Board which considered the report has suggested that the work should be restricted to mangoes, papayas, citrus, pine-apple and plantain. A detailed programme of work will be considered by the Advisory Board at its meeting in July 1936.

United Provinces.

The scheme in the United Provinces aims at development of the fruit industry in the Kumaon hill districts, and was started from July 1934. The Research Station and experimental orchard is at Chaubattia (near Ranikhet)—average altitude 6,500 feet with a range of 800 feet. Four sections have been established, *viz.*, Horticultural, soil chemistry, entomological and mycological, and the first progress report shows that the research is proceeding on sound lines. Among the more important experimental work are included :—the testing of apple—stocks including East Malling and Merton stocks ; and pruning experiments to mitigate hail damage ; storage and marketing experiments.

A soil survey of the orchard areas of the Kumaon Hills has been started. Work is in progress on the apple root borer (Lophosterous hugeli) and Woolly Aphis. Preliminary work was started on the diseases of apples, pears and peaches. Detailed programmes of future work in respect of each of these sections have been approved by the Advisory Board.

Bihar and Orissa.

The aim of the scheme in Bihar and Orissa is to devise lines of improvement in the horticultural industry in the ' plains ' of Bihar and Orissa and United Provinces and work was started from April 1934. It has been revised to include a Plant Physiologist for research on the alternate year bearing problem of mangoes. Dr. P. K. Sen was selected by the Public Service Commission for the post and took up work at the East Malling Fruit Research Station last Autumn. He will be engaged on research on alternate year bearing for a period of approximately two years and will be posted to Sabour on return in 1937.

The research carried out during the first year covered a wide range and included horticultural work on mangoes, litches and papayas. Much of this was of a preliminary character and included the collection and trial of local varieties. The Advisory Board considered the first year's progress report and made several suggestions for future work.

(*x*) *Cold Storage of Fruit.*—The Fruit Cold Storage research scheme under the Government of Bombay was started in March 1934 and in accordance with the programme approved by the Advisory Board, the main experiments carried out during the mango season of 1934 dealt with the optimum conditions in cold chamber for ensuring the longest " commercial storage life " of fruit picked at different stages of maturity. The following supplementary observations and inferences were also recorded :—

(*a*) the relation of temperature to maturity and storage life of the fruit ;

(*b*) the effect of temperature on the development of blush on the fruit ;

(*c*) the relation of temperature to any injury or breakdown of the fruit during storage and also a study of the nature of the different organisms responsible ;

(*d*) the relation of temperature to chemical changes in the fruit during storage ; and

(*e*) the relation of temperature to the rate of respiration and the storage life of the fruit.

As a result of these experiments the following practical conclusions were reached :—

(*a*) The commercial storage life of the *Alphonso* mango (from Thana District) of B stage of maturity is 61 days at 45°F. The total wastage recorded during the storage period was 9%.

(*b*) The Bhagalpur *Langra* mango is not suitable for cold storage. The fruits of this variety do not keep in good condition for more than three days. The skin loses colour within three to five days in the cold chambers though the pulp remains in a good condition for a longer time.

(*c*) The *Peter* mango (Salem) keeps well for 21 days showing a total loss of six per cent. during the storage period. At a temperature of 68°F. a good blush develops on the fruit.

(*d*) The *Suvarnarekha* mango (Bobbili) did not show very satisfactory storage behaviour. Discolouration due to the development of brown patches was noticed on these fruits from the very early periods of storage.

The Fruit Sub-Committee of the Advisory Board, after considering the report for the 1934 season, recommended that the following varieties of mangoes might be tried as opportunity occurred :—

Fazli—Bengal, and United Provinces.

Sirdalu—Bihar and Orissa.

Pairi—Bombay.

Azamusamar and Bonishan—Hyderabad (Deccan).

Badami and *Raspuri*—Mysore.

At the instance of the Director of Agriculture, Punjab, *Malta* oranges from that province were also included in the scheme and the necessary additional grant required has been sanctioned by the Council. It was decided that further extensions might well await the results of the fruit marketing surveys now in progress.

During the 1935 season experiments were laid out to confirm the results obtained during the previous season as well as to narrow down the range of temperatures suitable for the best commercial storage of the *Alphonso* variety. Fruits from localities other than Bombay were obtained and tried ; the full results of these trials will be discussed next year but the following preliminary reports are of interest.

Storage of Alphonso mangoes from Ratnagiri.

Fruits Stored at 43°F.—These fruits remained in a hard and green condition without any loss for eleven weeks. After 9 weeks of storage the fruits on being cut showed development of dark brown tissues just near the stone. The fruits kept at this temperature for two weeks ripened well when exposed to 68°F. for a week but after prolonged storage at 43°F., they did not ripen satisfactorily. The colour did not change completely to yellow and the pulp was not sufficiently sweet and juicy.

Fruits stored at 45°F.—The fruits remained in a hard and green condition for more than ten weeks. But after about eight weeks of storage some of the fruits developed dark brown spots and started decay. Ten per cent. loss was registered after 60 days. At intervals during the storage period some fruits were removed from this temperature and exposed to 68°F. for a week for ripening. The taste and condition of these fruits is shown in Table No. 2. It can be seen that storage for seven weeks did not tell much on the quality of the fruits. After nine weeks, the pulp was slightly tough and after ten weeks of storage the tissues just near the stone turned dark brown.

Fruits stored at 48°F.—The fruits remained in a hard and green condition for six weeks. Later on they began to change colour and at the end of ten weeks were yellowish green and slightly soft. After six weeks, some of the fruits started decaying like the fruits stored at 45°F., and ten per cent. loss was reached after 55 days of storage. At intervals during the storage period a few fruits were transferred to 68°F. for ripening. The taste and condition of these fruits is given in Table No. 2. It will be observed that storage for seven weeks did not affect the quality of the fruits. After nine weeks the pulp was slightly fibrous and after ten weeks of storage the tissues just near the stone had turned dark brown.

Fruits stored at 52°F.—The fruits began to change colour after four weeks of storage, turned yellowish green after seven weeks and yellow at the end of ten weeks. The fruits after seven weeks of storage were just soft with firm yellow flesh. Ten per cent. loss of the fruits was recorded after 48 days of storage. The yellowish green fruits did not keep well when exposed to 60°F. or the usual room temperature.

The percentage of wastage of fruits stored at 45°F. and 48°F. at different periods of storage life is tabulated below :—

TABLE No. 1.

Fruits stored at 45°F.		Fruits stored at 48°F.	
Storage period. Days.	Wastage. percentage.	Storage period. Days.	Wastage. Percentage.
55	1·7	51	6
62	12·6	62	18
72	19·5	72	38
79	40·0	82	66

From the above observations, it will be seen that the Longest Commercial Storage Life of Alphonso fruit of B stage of maturity is 60 days at 4 °F., 55 days at 48°F. and 48 days at 52°F. The hard green fruits from 45°F. and 48°F. when exposed to 68°F. or room temperature ripen in a week and can be kept for a week more after ripening in a good condition. The fruits from 52°F. do not keep so long at 68° F. or room temperature after five weeks of storage at that temperature. The range of temperatures 45°F. to 48°F. appears to be suitable and the fruits can be stored in good condition for seven weeks without being affected by the long period of storage. Further observations alone can show if the different localities have any influence on the storage life of the *Alphonso* mango.

Leaving, therefore, a safe margin of about a week, it can be taken that *Alphonso* mangoes of B stage of maturity can be stored for six weeks in good condition without practically any loss.

TABLE NO. 2.

Ratnagiri—Alphonso.

Temperature of storage.	Days of storage.	Taste and condition of fruits ripened at 68°F.
45°F. ..	37	Good yellow colour, flavour, juicy and sweet.
„ ..	50	Good yellow colour, pulp juicy and sweet.
„ ..	62	Good yellow colour, pulp slightly tough.
„ ..	75	Good yellow colour, pulp tough, development of darkening near the stone.
48°F. ..	37	Good yellow colour, flavour, pulp juicy and sweet.
„ ..	50	Good yellow colour, pulp juicy and sweet.
„ ..	62	Good yellow colour, fibrous pulp.
„ ..	75 (Turned yellowish green in the chamber).	Good yellow colour, fibrous pulp, darkening near the stone.
52°F. ..	37	Good yellow colour and flavour, juicy and sweet pulp.
„ ..	50	Good yellow colour, fibrous pulp.
„ ..	62 (Turned yellowish green).	Good yellow colour, fibrous and coarse pulp.
„ ..	75* (Turned yellow in the chamber).	Darkening near the stone.

The progress of the research work was discussed by the Vice-Chairman with the officers of the Government of Bombay and a detailed programme settled.

The question of gas storage of fruit is also receiving attention.

(*xi*) *Dry Farming.*—The object of this group of investigations is to devise improved methods of soil management and to breed and introduce drought-resistant strains of important crops in order that crop production in regions

*The fruits ripened in the chamber after this period of storage.

of scanty and precarious rainfall may be less of a gamble than at present. As in previous years quarterly reports were exchanged by the officers responsible for these schemes. With the starting of the Punjab Dry Farming Scheme the Director of Agriculture and the Agricultural Chemist, Punjab, have been added to the technical committee which co-ordinates the experimental programmes. During the year under review the first annual progress reports on the Bombay and Madras schemes were received. In Bombay work is in progress at both Sholapur and Bijapur and investigations have commenced simultaneously along three lines *viz.* :—(1) work on soils, (2) work on the *jowar* plant and (3) field experiments. The soil investigations included chemical and mechanical analyses of the various soils of this tract. Physical properties under study included hygroscopic coefficient, loss on ignition, 'Sticky point' wilting coefficient and reaction (P^H). Systematic moisture determinations of soils under various treatments were made fortnightly throughout the year and a study of rainfall disposal including run-off, evaporation and drainage is an integral part of the scheme. As part of the co-ordinated programme detailed observations on the behaviour of light strains of *jowar* are being recorded. The field experiments deal with (1) the value of treatments to prevent run-off such as bunding, scooping and listing, (2) the value of mulch in conserving moisture, (3) the value of the addition of F. Y. M. and san green manure, (4) the optimum time of sowing and the optimum plant population, and (5) the effect of fallowing. The effect of rotation is also being studied at Bijapur. In addition to this intensive experimental work the Bombay Dry Farming method is being tried on a large scale with a view to study its economic aspect and the modifications necessary according to the local needs. The work on the *jowar* plant included germination studies, developmental studies of the plant from germination to maturity, chemical composition at different stages, the water-requirements of the plant and studies on the effects of the various climatic factors on plant growth.

Work under the Madras scheme, included a detailed study of samples of soil obtained from plots which had been under differential treatment since 1927. The object of this study was to ascertain the distribution of soil moisture at definite stages of plant growth, to determine the soil characteristics and the effects of any of eight years of cultural and manurial treatment. Here also determinations of Hygroscopic coefficient, moisture equivalent, reaction (P^H) and sticky point are being made. Botanical work included the isolation and selection of suitable types of cotton and *cholam* and Italian millet. Experiments to test the effect of different spacings on yield gives interesting results which require confirmation. The field experiments are directed to ascertaining the relationship between tillage and bunding and their effect on soil moisture. Experiments on the effect of alternate year cropping and the investigation of different combinations of crops grown as mixtures were other items that received attention.

These progress reports were considered by the Dry Farming Research Schemes Co-ordination Committee of the Council which made various technical recommendations.

The first progress report of the Hyderabad scheme has recently been received. Work in the Punjab has been started only recently.

(*xii*) *Dacca University scheme for research on the Mechanical Analysis of Lateritic Soils and the Nutrition of the rice plant.*—The work on mechanical analysis of lateritic soils continued to make satisfactory progress during 1934-35. As a result of the Soil Science Committee's recommendations, the "Alkaline permanganate" method of dispersion was tested on various soils other than lateritic soils in different parts of India. The results thus obtained were examined by the Committee in February 1936, and it has been arranged that three samples each of the typical soils from Madras, Bombay, Bengal, Punjab, Burma, Central Provinces, Sind and Pusa will be sent to different laboratories in India for the cooperative testing of three methods of mechanical analysis, *viz.*—the Truog method, the International method and the Dacca alkaline permanganate method.

As regards work on the nitrogen supply of the rice plant, interest has centred on the isolation and identification of those *algae* of rice soils which are suspected of playing a part in the nitrogen circulation. Samples of rice soils have been sent to London where a preliminary examination has very kindly been carried out by Professor Fritsch who reports that the samples yielded a mixture of algal forms and that different species of *algae* predominated in different cultures. As it is highly desirable that there should be in this country a trained worker capable of carrying out the examination of soils for *algae* and the isolation of these organisms in pure culture, arrangements are being made to send Mr. P. K. De, a Research Assistant at Dacca, to the laboratory of Professor Fritsch to learn the technique and work on this problem.

(*xiii*) *Research into properties of colloid soil constituents.*—Professor J. N. Mukherji's scheme of work on colloid soils was extended for a further period of three years with effect from the 1st October 1935. The report for 1934-35 showed that the work has been extended from alumina and silica to colloidal acid clay isolated from samples of (*i*) silt from Ganges water (*ii*) Dacca Virgin soils collected at different depths and Dacca cultivated soils. The report was approved by the Soil Science Committee. The detailed results are published in the Indian Journal of Agricultural Science.

(*xiv*) *Preparation of cheap synthetic manure from town refuse and waste materials.*—The detailed technical programme of work in connection with this scheme submitted by the Indian Institute of Science, Bangalore, was considered by the Soil Science Committee and the Advisory Board and approved subject to certain modifications. These have been communicated to the Institute.

(*xv*) *Quality in crops.*—(*a*) *Rice.*—The report on the work in progress at the Indian Institue of Science in cooperation with the Paddy Specialist, Coimbatore, was considered by the Advisory Board in February 1936. During the period ending 30th November 1935 investigations were carried out on (*i*) the changes in composition of raw and parboiled rice on polishing (*ii*) the distribution of nitrogen and phosphorus in raw and parboiled rice grains and (*iii*) the influence of parboiling on the milling quality of rice. Work is continuing.

(*b*) *Barley.*—In the last report a brief reference was made to the results of the shipments of barley made from the United Provinces, Punjab, and Bihar and Orissa, during 1933-34. The Institute of Brewing had incidentally drawn

attention to the infestation of practically all Indian barleys with the *Khapra* beetle (*Trogoderma khapra*) which affected the prospects of those barleys in the United Kingdom for malting purposes. The Advisory Board considered this matter and at its instance the need for work on the control of this pest was brought to the notice of provincial agricultural departments.

(*xvi*) *The Chemistry of malting cholam.*—Work on this scheme was commenced from June 1935.

(*xvii*) *Use of Molasses as cattle feed.*—The utilisation of molasses has been under the consideration of the Sugar Committee and the Advisory Board from time to time. The Sugar Technologist to the Council has prepared a scheme of experimental work on the use of molasses in mixed cattle foods. It is proposed to prepare compound feeds of different compositions, using molasses from various sources (*khandsari*, sulphitation and carbonation) at the experimental sugar factory at the Harcourt Butler Technological Institute, Cawnpore. The prepared feeds will be systematically tested by the Physiological Chemist at Bangalore, and also tested in practical feeding trials at various other centres. A small grant for research on this subject for a period of two years has accordingly been sanctioned and work is to be started shortly.

10. *Cost of production of crops in India.*—The third and the last year of the enquiry into the cost of production of crops in the principal sugarcane and cotton growing tracts of India financed jointly by the Imperial Council of Agricultural Research and the Indian Central Cotton Committee will come to a close between May and September 1936 in all the provinces except Bengal and Bihar and Orissa. The collection of the primary data in the villages will, however, cease with the finishing of *Rabi* crop sometime in April or May and the intervening period will be utilized for arranging and checking the data by the district and the provincial staff. The work in Bengal and Bihar and Orissa, on account of their late start is expected to finish by March 1937.

The data for the last two years, after a preliminary check in the provinces and states are now being compiled and tabulated at the headquarters. The tabulated results will be placed before the next meeting of the Joint Sub-Committee.

The Chief Economist in charge of the enquiry, made extensive tours with a view to supervise and co-ordinate the work in the provinces.

11. *Sugar.*—(*a*) *Sugar Committee.*—A detailed account of the proceedings of the meeting of this Committee held in July 1935 and of the progress made with research work under the various schemes sanctioned by the Council, has already been given in sections I—III of paragraph 14 of the previous annual report. No further meeting of the Committee was held during the year. The following further action on the recommendations made by the Committee has since been taken.

The Imperial Council of Agricultural Research provided funds to enable Mr. Isaac, Second Imperial Entomologist who was then in London on study leave, to return to India *via* Louisiana, Porto Rico and Hawaii to study methods of control of the insect pests of sugarcane in use in those countries. When

approving the scheme for research into the insect pests of sugarcane at the Imperial Institute of Agricultural Research, Delhi, the Committee recommended that a meeting of Entomologists should be convened at an early date to consider the question of the immediate extension of work in the various provinces and to prepare a working scheme for ensuring co-operation between the central research station and the provinces. This committee accordingly met in February 1936 and drew up a detailed programme of research and also recommended methods of securing co-operation in this matter between the Second Imperial Entomologist, who will be in charge of the scheme, and the provincial officers concerned.

(*b*) *Funds for sugar research.*—In addition to the grant required for financing the running schemes, the Government of India have provided special additional grants for enabling the Council to finance certain important approved schemes, *viz.* :—

(1) Research into the insect pests of sugarcane at the Imperial Institute of Agricultural Research, New Delhi.

(2) Research work on the Chemistry of sugarcane by the Imperial Agricultural Chemist.

(3) Research work on the structural anatomy and developmental morphology of the sugarcane *sorghum* hybrids and the wild *saccharums* by Professor T. Ekambaram of the University of Madras.

(4) Sugarcane research scheme in the North-West Frontier Province.

(5) Investigations into the suitable types of cane for Gujerat at Baroda.

(6) The Experimental preparation of cattle feed from molasses by the Sugar Technologist.

Funds were also provided for the renewal for a further period of the following schemes :—

(1) The continuance of the sugarcane sub-station at Karnal;

(2) The sugarcane seedling testing station at Dacca;

(3) The sugarcane seedling trials at Shahjahanpur; and

(4) The Bihar and Orissa Sugarcane Research Scheme.

(*c*) *Progress reports on sugar schemes.*—A number of annual progress reports on the sugarcane research schemes have been received, most of which have been examined by the Sugar Committee and the Advisory Board. The following paragraphs contain a brief statement of the progress of research work under each of the schemes and the results achieved. Other reports will come before the Sugar Committee at its next meeting.

Sugarcane Sub-station at Karnal—

In 1929 the Sugar Committee recommended the establishment at Karnal of a sub-station of the Imperial Agricultural Research Institute for Sugar Cane Breeding, in order to establish the necessary contact with conditions of northern India. A grant was sanctioned for five years from 1931. This has now expired, and a second period of five years has been sanctioned, and an additional 12 acres of land for experimental work has been provided by the Imperial Agricultural Research Institute.

The Karnal Sub-station has enabled new seedlings from Coimbatore to be tested out at once under subtropical conditions, which include low temperatures and pests not met with at Coimbatore. Over 17,000 seedlings have been dealt with in this way, and of these about 100 are still under study. Partially acclimatised material of the new strains has been supplied to the sugarcane research stations in the Northern India.

In general, the material from Coimbatore has been obtained in the seedling stage, the plants being watered and tended during the 72 hours' journey by through wagon. It has also been found possible to germinate seed at Karnal.

One of the dangers to sugarcane in northern India is damage from frost. Recent experiments at Karnal have shown that there is a positive correlation between deep rooting and resistance to frost damage. Work on juice quality has given information as to the date of optimum quality and the rate of subsequent deterioration for various varioties. For this area one of the most useful canes is Co. 285, which shows resistance to drought, frost and pyrilla attack. Other promising canes are Co. 312, Co. 313, Co. 244 and Co. 331. Resistance to Mosaic disease is studied more particularly at Pusa.

Scheme for Sugarcane Research in Bihar and Orissa—

Work was started at the Mushari sugarcane station in 1932 and later a sub-station was opened at Patna. The main problems under investigation are the selection of more suitable varieties of cane for the different areas of the province, the evolution of disease resistant types, and the selection of early and late maturing varieties.

The work at Mushari suffered a considerable set back as a result of the Bihar earthquake of 1934, and an additional grant was made to enable the land to be cleared of sand deposits as quickly as possible.

A wide range of problems has been investigated. Agronomical work has been done on varietal trials, and questions of manurial and cultural practice. Botanical work has included studies on germination, growth, water requirements and root systems ; and chemical work has dealt with sampling technique, the use of the hand refractometer, and the progress of ripening and maintenance of juice quality. In 1935-36 about 2,487 maunds of seed cane of new varieties were distributed from the station to local growers.

Scheme for seedling trials at Shahjahanpur—

A grant was made in 1930 for the detailed examination at the U. P. Sugarcane Research Station, Shahjahanpur of cane seedlings from new hybrids, made by the Imperial Sugarcane Expert.

The practice of trying out seedlings instead of setts gives a better method of testing the new varieties under north Indian conditions, and avoids the rejection of seedlings simply because they fail to develop well at Coimbatore.

Seedlings raised at Shahjahanpur from seed set at Coimbatore are given the designation CoS, and a number of promising varieties have already been found suitable for United Provinces conditions.

A recent development has been to obtain seed, instead of seedlings, from Coimbatore and to germinate them under suitable temperature and humidity conditions at Shahjahanpur. Germination is fairly satisfactory, and this method avoids the difficulties attendant on the transport of young seedlings.

A further grant to cover a second five-year work has been sanctioned.

General Scheme for sugarcane research in U. P. at Shahjahanpur and Muzaffarnagar.—

The United Provinces contains one half of the total sugarcane area of India.

The earlier work of the Shahjahanpur Station has already been referred to. An additional research station has been established at Muzaffarnagar with the aid of a five-year grant from the Council, for research on cane agronomy and cane entomology to meet the particular needs of the Gangetic canal area. The scheme was approved by the Sugar Committee in 1930 and work commenced in 1932. The grant also covers a closer study of the physiology of sugarcane to be carried out at Shahjahanpur. The latter work cannot be sharply separated from the general agronomic work of the station. In 1934-35 the physiological problems mainly studied were :—

(1) The inter-relationship of nitrogenous manuring and water supply.

(2) The effect of climatic conditions on growth.

(3) Studies of development, particularly of root-system, in relation to various soils.

At Muzaffarnagar a good deal of work of an entomological nature is in progress on account of the greater havoc caused by insect pests in that part of the Province. Investigations are in progress on the incidence and control of attack by borers, pyrilla and white fly, and on the use of insecticides for checking white ants. A number of recommendations have been made for minimising insect attack. Manurial, cultural, and varietal trials have also been carried out at the Muzaffarnagar sub-station.

Scheme for breeding of thick canes in Mysore—

Work on sugarcane breeding has been in progress in Mysore State since 1912, and has produced a number of thick canes of promise, which have taken the place of the indigent canes.

A five-year grant, starting from the end of 1933, has been made by the Council to enable sugarcane research in Mysore to be extended, especially as regards breeding and the action of X-rays in inducing variations (bud-sports). Work under the scheme is carried out at Hebbal Farm, Bangalore, at the Irwin Canal Farm, Mandya ; and at the Central Laboratories , Bangalore.

A number of new seedlings have already been distributed for trial in the districts, and others are still under final trial in the test plots.

Cytological and histological studies of standard and new varieties are also in progress. Experiments to induce variations by treating buds with X-rays have given promising results, and this method may assist in speeding up the production of new varieties, and enable sugarcane breeding to be carried out in areas where desirable parents do not flower or set seed.

Scheme for Sugarcane Research in the Punjab—

This scheme was approved in 1932 and started from January 1934, and includes two testing stations, one at Risalewala near Lyallpur, and the other at Jullundur in the Central Punjab.

Although the Punjab stands second only to United Provinces in the matter of acreage under cane, the average yield of *gur* per acre is lowest of all the major sugar-growing provinces. This is partly because of the extremes of climate and low rainfall, but is also partly due to unsuitable varieties and indifferent methods of growing and manufacture. Apparently in some parts of the Punjab at least the high percentage of minerals in the juice interferes with crystallisation—an adverse factor in both *gur* and sugar manufacture.

The land at Risalewala (Lyallpur) is irrigated from the Chenab Canal and that at Jullundur by a tube well and the two stations are representative of two different tracts.

Agronomic experiments include the usual varietal, manurial and cultural experiments. The varieties Co. 312 and Co. 313 have been shown to give better results than the indigenous and previous standard canes, and other varieties are recommended for special conditions of soil and irrigation. The yields of *gur* at the experimental stations have been raised to over 140 maunds per acre, showing that much improvement is possible. Other varieties such as Co. 285 and Co, 221 have been found profitable where conditions of cultivation are adverse.

Chemical studies are also in progress, and separate reports are issued by the Entomological and Mycological assistants who work under the direction of the Government Entomologist and Professor of Botany respectively.

Scheme for extension of sugarcane work at Jorhat, Assam—

In 1932 a five-year scheme was sanctioned for the extension of sugarcane work at Jorhat Experimental Station, Assam, and the scheme came into operation from August 1933.

An area of 54 acres adjacent to the Jorhat Farm is provided for this work, and experimental work is in progress on varietal trials and manurial trials, both with ratooned and planted cane. Particular attention is paid to full chemical analysis in all experiments.

Scheme for Sugarcane Research in the Bombay-Deccan—

In 1930 the Sugar Committee recommended that a scheme of research should be evolved to deal with sugarcane problems in the Bombay-Deccan.

The suggested programme included work on Deccan soils, production of more suitable canes than Pundia, water and manurial requirements, improved cultural methods, and the economics of sugarcane production.

A five-year scheme was sanctioned and work commenced in 1932, at Padegaon, a site representative of the Deccan Canal area.

Work is divided into three sections: Soil Physics, Crop Physiology, and Agricultural, each section being in charge of a responsible officer. A large amount of information has been collected as to the physico-chemical nature of the soil types in the various sugar growing areas and their probable behaviour under irrigation. With certain soils irrigation presents dangers only avoided by appropriate rotation and manuring. Other work of the Soil Physics Section includes soil fertility surveys—which have shown that one of the commonest causes of soil deterioration is a high carbon nitrogen ratio due to want of proper fallows and rotations—farm experiments on various soil factors, soil colloid studies, and work on soil bacteriology.

The Crop Physiology Section has carried out bio-climatic studies in relation to germination, growth, and top borer attack; work on water-requirements both in pot culture and under field conditions; work on manurial requirements; germination studies; and an investigation of the relation of water and manure requirements.

The agricultural section has carried out field experiments on manurial problems and irrigational problems which have corroborated and amplified the work of the Physiology Section. Cane varietal trials of promising Coimbatore selections have also been made. Co. 419 has given the highest yield of 56·4 tons per acre.

Scheme for Sugarcane Research at Dacca—

A Seedling-testing Station in Bengal was Started in November 1931 on a five-year grant. During the past few years about 100 varieties have been studied each season and compared with the standard Co. 213. Promising varieties have been sent out for further trial in the districts.

This work has been of considerable value to sugarcane cultivation in Bengal and the Council has approved an application for a continuance of this small grant for a second period of five years.

Scheme for Sugarcane Research in Madras—

Sugarcane research stations already existed in Madras at Coimbatore (Imperial) and at Anakapalle (Provincial), but in 1929 the Government of Madras considered that an expansion of sugarcane cultivation was desirable, and put forward a scheme which was finally modified and sanctioned in 1933.

The scheme provides for extension of the work at Anakapalle, which deals with flow irrigation areas, and for a smaller research station near Chittoor for tracts under lift irrigation. The site for the sub-station was not settled until 1934, when work was started at Gudiyattam in North Arcot. The programme of work includes varietal, cultural, and manurial experiments, methods of reducing the cost of cane production, and improvements in the manufacture of jaggery.

At Anakapalle over 80 varieties of sugarcane are under study for various botanical and chemical characters. Attention has been given to irrigation problems, the varieties most suitable for swamp conditions, and the possibility of including sugarcane in dry land rotation. The advantages and disadvantages of ratooning have been the subject of field experiments, and the results so far indicate that (1) certain varieties are better adapted for ratooning than others, and (2) in wet land the yield of a plant crop is in general better than that of a ratoon crop. Plantings made at different seasons of the year show that good results are obtainable at two seasons, February to April, and September to November. By a suitable adjustment of varieties in the monthly plantings, the crushing of cane can be continued from mid-November until the end of May.

At the Gudiyattam sub-station work is now in progress, on varietal, cultural, and manurial lines, with the object of securing increased yield of cane, reduced cost of production, and improvement in the final product.

Scheme for sugarcane research in the North-West Frontier Province—

Among the schemes to be financed immediately is the extension of the chain of testing stations to cover the North-West Frontier Province, the grant being for five years in the first instance. The scheme was approved by the Advisory Board in 1933 and funds are provided in 1936.

Sugarcane is an important crop in this province, and may be capable of great expansion. Owing to lack of funds comparatively little research has been carried out so far. A special problem at this station will be the testing of canes for frost resistance. It is proposed to open a sugarcane station in Charsadda sub-division to take up the following work :—

(*a*) Varietal tests.

(*b*) Manurial tests.

(*c*) Cultural tests.

(*d*) Irrigation tests.

The scheme will be in charge of a Sugarcane Specialist, and an experienced Chemist will be appointed.

Scheme for investigation of mosaic and other sugarcane diseases—

In 1931, a scheme was sanctioned for research in mosaic and other diseases of sugarcane. The period was for three years in the first instance, but this was afterwards extended to five years. Work was begun at Pusa in June 1932, under the direction of the Imperial Mycologist, who had already devoted some attention to this problem.

The progress of the scheme has been hampered by various difficulties—due to earthquake, delays in appointment of staff, and frequent changes of personnel—but a considerable amount of information has been amassed.

Careful and long continued experiments have confirmed the earlier conclusion that for Co. 213 a very high percentage infection by mosaic may produce a loss of yield of 10—15 per cent. Surveys carried out in various districts of Northern India lead to the general conclusion that the low mosaic infections

commonly occurring are only a very small source of loss to the thin canes grown. Natural spread is slight as contrasted with conditions in South India, and by suitable seed selection mosaic may readily be kept under control. Yield experiments are in progress to determine the losses mosaic infection is capable of causing in thick canes.

From the more fundamental aspect, the study of mosaic virus has been pursued in various directions. The conditions for successful artificial inoculation have been worked out, and also the effect of inoculating juice from affected cane into other genera of plants. Infection only occurs during a restricted season, and by the use of maize as a test plant it has been found possible to prolong the season for certain types of experiment.

Physical and chemical factors—heat, cold, filtration, chemical substances, pH, etc.,—have been tested for their effect on the activity and viability of mosaic juice. Indications have been found confirming the existence of several kinds of sugarcane mosaic virus. Serological work is in progress, using rabbits as test animals, to check the specificity of virus from different sources.

Some evidence has been put forward indicating the association of a bacterial cyclostage with mosaic infection. There is still considerable doubt, however, as to the validity of these results and they should be regarded as tentative for the present.

As regards the fungal and bacterial diseases of sugarcane, much information has been gathered regarding the known diseases of red rot, smut, top rot, etc. Pineapple disease and red-stripe have been found to occur in India, and the bacterial " Stinking Rot " and several new seedling diseases have been described for the first time. Red Rot, the most serious of sugarcane diseases in India, can be controlled by suitable examination of setts before planting. Internal reddening often confused with red rot has been shown to be attributable to saprophytic organisms following attack by borer. The low sugar content of such cane is due, not to destruction of the sugar by the micro-organisms, but to interference with normal course of sugar production in the plant.

An illustrated manual on sugarcane diseases has recently been published as a Bulletin. Diseases not yet known in India have been included, for fresh diseases are constantly being reported.

Much work remains to be done, on the purification, transmission, and physical properties of mosaic viruses, and it is possible that fresh information on these points may prove to have unexpected practical applications. As regards fungal and bacterial diseases, further research is needed on their morphology and life histories, the existence of physiological races, and their inter-relationships in disease succession. Controlled inoculation experiments are necessary for the rapid testing of new and existing varieties for resistance to disease and for determining the effects of soil and climatic conditions on the virulence of disease. It seems desirable that the scheme will be renewed to enable this work to be completed.

Scheme for establishment of a Bureau of Sugar Standards—

A grant covering a period of 4¼ years from January 1935 has been sanctioned for the establishment of a Bureau of Sugar Standards under the control of the Sugar Technologist to the Council.

The sugar turned out by various factories in India shows a wide variation in colour and grain, and market quotations are based on the name of the factory rather than on recognised standard grading. With the expansion of the industry some system of standardisation has become essential. Arrangements have been made to obtain an adequate supply of all the products of Indian sugar factories. These are graded on the basis of colour and size of crystals. Twentytwo standard grades have been agreed on by a special subcommittee composed of mill representatives under the Chairmanship of the Sugar Technologist. It is anticipated that the expenses of the scheme will be recovered by the sale of sugar standards, for each set of which a fee of not less than Rs. 100 will be charged. In addition to the preparation and supply of sugar standards each year, and the maintenance of a museum of samples of sugars and sugar products, an annual review will be published dealing with the quality of different grades of Indian sugars, giving comparative figures for competitive foreign sugars.

A small advisory committee has been set up to assist the Sugar Technologist in grading sugars and preparing standards. This Committee includes representatives of sugar manufacturers, dealers and brokers.

Scheme for sugarcane crushing and gur *boiling experiments in Bengal—*

A grant was made to enable an improved small power cane crusher to be constructed from the design of the Agricultural Engineer, Bengal.

The mill was tested at in the cane season 1931-32 and its performance compared well with that of much larger and more expensive mills. The system of grooving on the various rollers ensures complete breaking up of the cells and extraction of the juice.

An improved *gur* on *rab* furnace was also constructed and has given satisfactory results in practice.

Scheme for experiments in devising satisfactory small power crushing mills—

In 1930 the Council made a small grant of Rs. 8,000 to each of the three following provinces :—

United Provinces, Punjab and Bihar and Orissa, for the purposes of carrying out experiments in the design of small power sugarcane crushing mills.

Both in the United Provinces and in Bihar and Orissa suitable crushers have been designed and only minor improvements are now needed. The Bihar and Orissa Government have finally standardised their design and made arrangements with a local firm for the manufacture and sale of the mill at a price not exceeding Rs. 1,250. In the United Provinces two successful types have been designed and tested. These are under extensive tests in private farms under practical conditions. The Council has prescribed certain conditions for the manufacture and sale of the improved crushing mills designed as a result of this grant.

In the Punjab the grant was made specially for a study of the suitability of various types of small crushers for electric drive—a matter of special importance in hydroelectric grid areas. The original grant was exhausted without any results and a second grant was made in 1932. A three roller mill has been

manufactured with this grant and has been under trial. The local Government do not consider it worthwhile to continue work on this crusher as there is no demand for this type of crusher owing to the depression in the open pan sugar making but it is intended to continue the trials during the next season.

Research on the morphology and anatomy of sugarcane, sorghum hybrids, and wild Saccharums—

This scheme was approved by the sugar Committee in 1933 and the Governing Body in 1935 and a small grant, spread over three years, was sanctioned for research on developmental morphology and anatomy at the University of Madras under the direction of Prof. T. Ekambram.

Because of the importance of the fibre content of sugar-cane to be manufactured and of standing power to the cultivator it is of considerable interest to know more of the inheritance of anatomical characters both in sugarcane and the sugarcane-sorghum hybrids.

The programme includes :—

(1) a study of the development of the tissues of seedlings of sugarcane. wild saccharums, and sorghum hybrids.

(2) a study of their adult anatomy with a view to gaining knowledge of the inheritance of anatomical characters.

Scheme for research on chemistry of sugarcane—

In 1933 an application was made by the Government of Madras for a five-year grant for research on the chemistry of sugarcane with special reference to the sorghum, sugarcane hybrids. This scheme was eventually sanctioned with some modifications. In view of the fact that the Madras Agricultural Chemist, who prepared the scheme, has since been appointed Imperial Agricultural Chemist, permission has been granted to the transfer of the work to the Imperial Agricultural Research Institute.

The proposed scheme aims at supplementing the extensive research already carried out in breeding of sugarcane and sugar technology by a systematic study of the chemistry of sugarcane. The ash and salt content of different varieties needs investigation, together with its relation to quality of the cane. Another important point for study is the nature of the non-sugar constituents in the Sorghum hybrids. A fuller knowledge of the processes leading to the formation and storage of sucrose in sugarcane may yield valuable applications to agricultural practice. The effect of the composition of the juice on clarification and filtration will also be investigated.

Scheme for research and testing station for the indigenous system of sugar and gur *manufacture—*

A five-year scheme by the Sugar Technologist was approved by the Advisory Board and work will begin in 1936.

This scheme provides an experimental station for the purpose of testing existing processes and machinery used for the manufacture of *gur*, *rab* and sugar by indigenous systems, for conducting trials of new plant and processes, and for research work with the object of introducing improvements. One of the functions of the research station is to provide training for operatives in improved methods

The site chosen is at Bilari in the Moradabad district, which is a good centre for sugarcane supply, a typical centre of the *Khandsari* industry, and has cheap electric power available.

Grant to Sugar Technologist for the construction and testing of an improved juice boiling bel—

In the course of experiments on the open pan system of white sugar manufacture, the Sugar Technologist to the Council designed a new *bel*, which he considered would be an improvement on the Bhopal and Rohilkand bels already tested.

On the recommendation of the Sugar Committee in 1930, a small grant was made early in 1932 so that the improved design might be constructed and tested.

One advantage claimed for the new *bel* is that it is fitted with an improved type of furnace that enables partially moist bagasse to be used thus making the working of the *bel* more independent of weather conditions. This scheme now merges in the main schemes of research on indigenous methods.

Scheme for investigation at Patna of the possibilities of manufacturing Khandsari sugar by a single pan method—

The scheme was approved by the Sugar Committee in November 1933 and the Advisory Board in February 1934, and a small grant, for a period of three years from 1934, has been made to the Government of Bihar and Orissa for investigating the manufacture of sugar by a single-pan process instead of the multiple pans commonly employed. When the cultivator cannot profitably dispose of cane to a modern factory, it may be more profitable for him to make *gur*. The small cultivator would produce *rab* which would be bought by co-operative societies and others owning centrifugal machines.

Special attention is being given to questions of fuel economy and the prevention of inversion of sucrose. This scheme is nearing completion.

Scheme for the manufacture of Cattle-feed from molasses—

The scheme was approved in 1935 and funds provided in 1936 for two years' investigation of the possibilities of utilising molasses as cattle feed. This is a common method of disposing of surplus molasses in America, but experimental work is necessary to test the utility of such feeds under the different climatic conditions of India with the molasses from both carbonatation and sulphitation factories, and if these results are satisfactory the experiments must be followed by propaganda to popularise molasses as a cattle food.

It is proposed to make feeds of different composition, *e.g.*, bagasse plus molasses plus oil cake, grain, etc., using molasses from various sources (Khandsari, sulphitation, and carbonation) and to have these tested at different cattle breeding stations.

The work will be carried out at the Experimental Sugar Factory attached to the Harcourt Butler Technological Institute, Cawnpore, under the supervision of the Sugar Technologist.

(d) Sugar Technologist and Sugar cable service.

(i) Industrial and Technical.—112 factories making sugar direct from cane are reported to have worked in India during the season 1933-34 as against 57 in the previous season. 19 new sugar factories were built for working in 1934-35, making a total of 142 cane factories in India. 130 of the 142 factories are reported to have worked during the season 1934-35; 6 factories were not ready for working in time, 3 failed to submit returns, 2 did not work owing to financial difficulties and 1 has been excluded as it is a small experimental factory for training of students with a nominal and uncertain output. The total number of cane factories operating during the season 1935-36 is estimated at 139 as against 130 in 1934-35. 16 factories refined *gur* during 1934 compared with 27 during the previous year. It is estimated that 12 factories refined gur during the year 1935.

The position of the sugar industry in India on its technical side is best shown by an analysis of the average percentage recovery of sugar from cane for factories in different provinces of India during the season 1934-35 compared with that of the previous season.

Average percentage recovery of sugar from cane during the seasons 1934-35 and 1933-34.

Particulars.	1934-35.				1933-34.			
	U.P.	Bihar and Orissa.	All other provinces.	All India.	U. P.	Bihar and Orissa.	All other provinces.	All India.
Maximum ..	10·44	9·74	11·10	11·10	10·27	10·00	10·98	10·98
Minimum ..	5·45	6·93	5·00	5·00	6·60	5·50	4·38	4·38
Mean ..	8·56	8·79	8·77	8·66	9·08	8·32	8·75	8·80

The highest recovery for the season was 11·10 per cent. as against 10·98 per cent. during the preceding season. The average extraction for the whole of India showed a slight decline, the figure being 8·66 for 1934-35 as against 8·80 for 1933-34. The average extraction percentage in factories in Bihar and Orissa which had dropped to 8·32 in 1933-34 as a result of the earthquake, recovered to 8·79 in 1934-35. In the United Provinces the recovery declined from 9·08 per cent. in 1933-34 to 8·56 per cent. in 1934-35 due to the cane crop having been damaged in two western districts. It is gratifying to note that the highest recovery obtained during the season 1934-35 exceeded 11 per cent. As in the season 1933-34, as many as 9 factories in India had recoveries of 10 per cent. and over during the season 1934-35. Out of 130 factories 45 had recoveries of 9 per cent. and over and 92 had recoveries of 8 per cent. and over. In Southern India especially in Bombay, the majority of factories had recoveries of over 10 per cent. In the United Provinces the factories situated in the eastern districts did fairly well as they had the advantage of a more or less normal crop. The working results of factories in Bihar and Orissa were on the whole satisfactory.

The advice of the Sugar Technologist was sought for a variety of purposes in connection with suitable sites for new factories, specifications of machinery, scrutiny of tenders and advice of a technical nature. He inspected a number of

sugar factories and made extensive tours in the discharge of these duties. The following table illustrates the varied nature of his activities :—

1. Number of persons advised regarding sites, etc.	123
(*i*) Specifications and schemes drawn up and tenders and factory-run reports scrutinised	30 *
(*ii*) Technical advice dealing with erection, starting up and extension (including sites)	93
*2. Number of factories advised during operation regarding efficiency of working	116
3. Number of replies regarding technical education in India and abroad	55
4. Number of replies to general technical enquiries (excluding the above)	366
5. Number of sugar factories helped in recruiting their technical staff	33

(*ii*) *Sugar Section of the Harcourt Butler Technological Institute.*—The following laboratory work was undertaken in the Sugar Section of the Institute of which the Sugar Technologist is the honorary Head :—

1. The assay of a few grades of Indian sugars following the methods adopted in the Java Profstation.
2. Complete analysis of typical samples of exhausted molasses from various Indian sugar factories.
3. Complete elimination of lime from molasses.
4. Semi-large scale tests on the Experimental Effluent Plant.
5. Erection of an improved molasses boiling furnace for the manufacture of road composition from molasses.
6. Conductometric estimation of ash in various grades of Indian sugars.
7. Experiments on the manufacture of balanced cattle feeds with bagasse.
8. Activated compost from cane trash.

(*iii*) *Research and Testing Station for the indigenous system of Gur and Sugar manufacture.*—During the year under review the agreement for the supply of sugarcane and water to the Research Station at Bilari and for the disposal of finished products was finally signed and registered. Contract for building construction was given and the work was nearing completion. Orders for the purchase of laboratory equipment and chemicals were placed and part of the supply received. Some second-hand machinery was purchased and orders for new machinery, such as electric motors, etc., were placed through the Indian Stores Department. A booklet in English on the open Pan System of Sugar Manufacture was compiled and submitted for publication.

(*iv*) *Bureau of Sugar Standards.*—The sets of standards were ready for distribution in August 1935 and upto the end of February 1936 seventyone sets were sold—mostly to sugar factories and sugar merchants. Indian sugar

* Under Sugar Production Rules, 1935, returns received from factories are being scrutinised and necessary advice given to individual factories.

factories and sugar merchants were circularized regarding the use of the sugar standards. Copies of the following pamphlets were sent for information to all the Indian sugar factories, and to the important sugar merchants and sugar brokers :—

1. The Indian Sugar Standards, and
2. Measuring the quality of sugars by means of the Indian Sugar Standards.

Samples of sugar, *gur*, rab and jaggery for the museum were obtained from different parts of India. The samples of sugar received were compared with the Indian standards and a report in respect of each sample was sent to the factory concerned. A review of the quality of sugar samples received is being compiled and will be published in due course. Arrangements are now in hand for the preparation of standard sets for the year 1936.

(*v*) *Sugar production Rules, 1935.*—The Sugar Production Rules, 1935, framed in accordance with the provisions of Section 5 of the Sugar Industry Protection Act, 1932, and the recommendations of the Tariff Board came into force from 1st November 1935. The staff necessary for this work was appointed from 18th December 1935. The work being done in this connection consists of (*a*) the collection, compilation and distribution in a consolidated form of technical data and commercial statistics relating to the Sugar Industry, (*b*) scrutinising and commenting on the results obtained by the individual factories and giving further advice wherever necessary, (*c*) publishing from time to time such data and information as is considered essential for the development of the industry, and (*d*) to keep in a readily available form such information as may be required from time to time by the Government of India, on all aspects of the Sugar Industry in India as well as abroad. A pamphlet embodying the Sugar Production Rules, 1935, with explanatory notes has been published and distributed to the Indian sugar factories, etc. The First Forecast on the production of sugar directly from cane by modern factories in India during 1935-36 already published is based on the returns submitted under these rules. Consolidated statements of (*a*) manufacturing data, (*b*) total price paid for cane and the net price received by the grower and (*c*) sugar production and stocks, are prepared every month and distributed to the factories submitting returns and to all local Governments and representative sugar organisations. It is gratifying to note that the Industry has already realised the usefulness of such mutual control data and with the experience gained during the first season, it is hoped that the utility of this work to the industry will be still more enhanced.

(*vi*) *Statistical.*—Statistical work on sugar production and trade continued during the year under report. As in the previous years, notes embodying information of use to the Sugar industry in India were supplied to the Director General, Commercial Intelligence and Statistics, Calcutta, for publication in the Indian Trade Journal. Brief reviews of the cane crop conditions in different parts of the world were compiled for incorporation in the all-India sugarcane forecasts published by the Director-General, Commercial Intelligence and Statistics, Calcutta. The Final Forecast on the production

of sugar directly from cane in modern factories in India for 1934-35 and the First Forecast for the same for 1935-36 were published in the Indian Trade Journal. Notes on the production of sugar from cane in modern factories in India during 1934-35 and on the production of sugar refined from *gur* in India during 1934 were also published in the Indian Trade Journal during the year under report. The Annual Review of the Sugar Industry in India for the year 1934-35 was compiled for publication in the Journal. The Director General, Commercial Intelligence and Statistics, Calcutta, was furnished with brief notes on monthly exports of sugar from Java which were regularly published in the Indian Trade Journal. He was also supplied regularly with weekly quotations for edible *gur* in important markets by telegram. Figures of stocks of sugars at the major Indian ports together with the first cost quotations for Java white sugar and the price quotations for typical Indian factory sugars indicating their maximum and minimum limits in the Cawnpore sugar markets were also sent to him every week.

The Sugar Cable Service and the Sugar Postal Service continued to obtain and distribute to members early and reliable crop and market reports regarding sugar in the principal countries of the world. The Indian Sugar Trade Information Service continued to collect and distribute among its subscribers daily quotations and weekly reports for sugar from important Indian sugar markets. These quotations were as usual utilised by the Directors of Industries of Bihar and Orissa and the United Provinces for the fixation of minimum prices for sugarcane in these provinces.

(*vii*) *Training in Sugar Technology.*—During the year 1935-36 the number of students from various provinces admitted on the nomination of the Imperial Council of Agricultural Research to the three sugar courses at the Harcourt Butler Technological Institute, Cawnpore, was as follows :—

	I. C. A. R. nominees.	Students from the U. P.
Sugar Diploma course	10	10
Sugar Analysts course	4	5
Sugar Boilers course	8	8

Of these, four each came from Madras and Indian States, three each from Bihar and Orissa and Bengal, two each from the Punjab, N.-W. F. Province and Central Provinces, and one each from Bombay and Assam. The number of students from the United Provinces has been shown for comparison.

(*viii*) *Employment Bureau.*—The Employment Bureau maintained by the Sugar Technologist continued to maintain a list of qualified persons which was utilised for supplying men to the sugar factories requiring technical staff. The Bureau assisted a number of successful students of the Sugar Technology courses to secure suitable employment.

(*ix*) *Publications and Library.*—Fifteen notes giving detailed statistical information were published in the Indian Trade Journal. The Sectional Library was freely used by persons interested in the sugar industry. 117 volumes were added to the Library during the year.

12. *Scheme for the extraction of flax fibre.*—For some years past the Assistant Fibre Expert, Bengal, had been conducting experiments on a small scale in the extraction of flax fibre and it has been found that further investigations are necessary on the following matters of detail :—(*i*) the time of harvesting, (*ii*) storage of straw, and (*iii*) methods of extraction. A small grant has been made to the Bengal Agricultural Department for experiments on a new method of extracting fibre flax from unretted straw and for the purchase of small hand-power breaking and scutching machines. This work is also of potential interest to the United Provinces and Bihar. Work is to start very shortly.

13. *Soil Science.*

(*i*) *Soil Science Committee.*—In pursuance of the decision of the Council that members of all Sub-Committees appointed by the Governing Body under rule 30 of the Rules and Regulations of the Council shall relinquish their membership on the expiry of two years from the date on which they became members of the Sub-committees, but that they shall be eligible for re-appointment to those sub-committees, the Soil Science Committee has been re-appointed with the membership shown in Appendix III. These members will hold office for a period of two years from November 1935.

The Committee met in February 1936 in conjunction with the meetings of the Advisory Board and in addition to reporting on a number of new schemes on soil research, examined the progress reports on three schemes, *viz* :—(*a*) The report of the Physical Assistant (for soil problems) to the Agricultural Chemist, Bengal ; (*b*) Research on the properties of colloid soil constituents by Professor J. N. Mukherjee of the Calcutta University and (*c*) The Dacca University scheme of research on the mechanical analysis of lateritic soils and the nutrition of the rice plant.

(*ii*) *Third International Congress of Soil Science.*—The report submitted by Professor J. N. Mukherjee, D.Sc., the leader of the Indian Delegation, was made available to the members of the Council, the members of the Soil Science Committee and to the Indian Society of Soil Science and through the last named to the soil workers in the country. The report contains a useful record of the discussions on soil study. This report included a very good summary of the discussions on present day soil studies, the methods employed and their utility and applicability. It should be of value to all soil workers in India.

14. *Statistical Section.*—The principal function of this section, which might more aptly be termed a biometrical section is to assist agricultural officers in the various Provinces and the Constituent Indian States in the planning and analysis of results of field experiments. It is also responsible for the general examination and scrutiny from a statistical standpoint of all schemes pertaining to Agriculture and Animal Husbandry financed by the Council. In all cases involving statistical interpretation of biological data the Statistician is consulted before the detailed technical progammes are framed.

The advice of the Statistician was freely sought as to the conduct of field experiments and in several cases he visited the farms with a view to give the necessary help as regards the lay-out of fields and other statistical details.

The Statistician was consulted also by the Imperial Institute of Agricultural Research, Pusa and the Indian Tea Association, Assam. References to the section during the year numbered 72. The progress reports of the several schemes financed by the Imperial Council of Agricultural Research were examined from a statistical standpoint and the results of such examination passed on to the appropriate committees of the Advisory Board. A note was circulated to members of the Advisory Board on the value of 'Confounding' in the lay-out of field experiments.

(*i*) *Publications.*—A set of statistical tables based upon what is known as Fisher's 't' was prepared in the Statistical Section in the course of the year and has met with the approval of Dr. R. A. Fisher. These tables will shortly be published.

(*ii*) *Training in Statistical Methods.*—The Statistical Assistant at Sakrand Agricultural Experiment Station (Sind) was deputed for training under the Statistician in modern statistical methods as applied to field technique for about six weeks.

The Governing Body of the Council has sanctioned the continuance of the section for a further period of five years from 1st December 1935.

15. Locusts.

(*i*) *Locust Movements.*—During July, 1935, there were a few reports of the activity of comparatively small swarms in the north-western portions of the Indian Desert. On the 1st July, a swarm was reported to have passed over Shahgarh in the Jaisalmer State, on the 4th July, another was said to have been noticed near Reti in the Bahawalpore State and on the 19th and the 29th July, two loose swarms visited the Khairpore area. No swarms have been reported since then.

(*ii*) *Locust Survey Work.*—Survey work, with the object of keeping the activities of the solitary type locust under observation in its natural breeding grounds, was continued throughout the year. In order that work might be more intensive the areas under observation were curtailed considerably, being restricted to the desert portion of the Thar-Parkar District in Sind, to southern Marwar and Jaisalmer, and to the desert portions of Bikaner and east Jaisalmer. The survey work was supervised by two Assistants with headquarters at Bikaner and Barmer respectively; in addition, two more desert outposts were opened, one at Nokh in east Jaisalmer and the other at Barmer in south Marwar. In the Mekran area, a new sub-circle under a Fieldman was opened for the survey of Kulanch and Dasht areas, and survey work was carried out on a very intensive scale throughout Mekran.

The usefulness and efficiency of the survey organization became evident when a sudden incursion of locusts on a large scale occurred in North-West India in July 1935. While the increase of locust population was noticed by comparatively few of the local inhabitants, it was immediately detected and reported by all the survey units.

(*iii*) *Ecological Studies.*—Studies on the ecology of the solitary phase of the Desert Locust were continued at Pasni and Ambagh. In addition, intensive surveys were conducted around the outposts in the Desert and in Mekran,

so as to obtain definite records of the activities of the solitary locust during different seasons.

(*iv*) *Spring Breeding.*—The winter rains of 1934-35 were early and copious in the western *reks* of the Mekran Coast, and the rainfall at Pasni amounted to about 11·60 inches between the 15th December 1934 and 15th February 1935. Extensive breeding followed on most of the *reks* from Ormara westwards to Jiwani, and presumably there was similar breeding further westward along the Mekran Coast in the Persian region also. Locust breeding was not confined to the coastal areas but was noted also in the interior of Mekran during April and May.

(*v*) *Cases of Incipient Swarming in Mekran.*—In June and July, 1935 reports of the occurrence of gregarious hoppers in patches of cultivation were received from the State authorities at (*a*) Shashtal near Nasirabad in the Kech valley, (*b*) at Gar on the banks of the Gwargo and at Sehgazan on the banks of the Rakshan in Panjgur area, and (*c*) near Washuk in Kharan. Reports of this kind would indeed not have been worthy of comment, had they occurred during years of locust infestation, but since there have been no reports anywhere between January and July 1935 of the existence of locust swarms in Baluchistan, the appearance of gregarious hoppers in these localities would appear to represent instances of an actual transformation of the solitary phase into the gregarious. It is presumed that a migration of forms produced on the coastal *reks* had occurred during April and May into the interior of Mekran, and that concentrated egg-laying had been induced in suitable sandy areas in the vicinity of patches of cultivation. The occurrence of fairly good rainfall in the Kech and Panjgur valleys during April had probably provided the soil-moisture needed for egg-laying. In all cases, the adults emerging from these gregarious hoppers had disappeared soon after they became full-fledged in June-July.

(*vi*) *The July Locust Incursion.*—In July 1935, a widespread incursion of locusts was noticed in most parts of Sind and Rajputana, and in certain parts of Baluchistan, such as the Kachhi and Lasbela areas, and along the coastal tracts of Mekran. Except in parts of the Jaisalmer and Khairpur States, swarms were not observed, and it is obvious that the accretion of Locust population noticed in most places had been due to the entry of locusts singly by way of individual flights. On being examined biometrically, it was found that a great many of the immigrant locusts had Elytron/Femur ratios of the *intermediate* and *gregaria* types, while most of the locusts found prior to the incursion had ratios approximating to the *solitaria* type. Some of the individuals were, moreover, of bright yellow colour, while a great many showed pinkish colouration both on the wings and on the body.

(*vii*) *Summer Breeding.*—The appearance of large numbers of locusts in the Sind-Rajputana area at a time when monsoon rainfall was due to occur in that area, gave reasonable grounds for apprehension that thereby a new cycle of infestation might be inaugurated in the Indian area, as had happened in the year 1926 All the desert areas were, therefore, carefully watched in order to discover cases of intensive breeding with a view to control them, if possible. The monsoon rains proved, however, to be on the whole below normal in most of the desert areas In the districts of Karachi, Lasbela and

Mekran, there was a total lack of rainfall, while in the desert areas, the rainfall in August and September was very scanty, so that the extent of breeding was much below expectation, and consequently, the locust invasion more or less fizzled out.

(*viii*) *Migration of Solitary Locusts.*—Although during previous years indications had not been lacking of the ability of solitary locusts to migrate from one place to another, no definite evidence was forthcoming. During 1935, however, much evidence has accumulated on this subject, chiefly in connection with observations made on the locust incursion of July. In the absence of evidence as to the entry of swarms, there is little doubt that the arrival of the migrants of the July incursion must have taken place in the form of individual flights. Direct observations have also shown that solitary locusts do sometimes rise high into the air and banish from sight. In such cases, it has been observed that the direction of flights is very often influenced by the direction of the prevailing winds. In one case, a locust marked and released at Pasni early in May 1935 was found on the 17th May at Rumro about 20 miles distant.

In addition, in the course of a study of the fluctuation of locust population at Pasni and Ambagh during the last four years, it became evident that some of the rises and falls in the population could not be accounted for except on the basis of the possibility of a seasonal exchange of population between different breeding grounds. Again, a study of the distribution of locusts during the different parts of the year 1935, showed that during the winter and spring months there was a preponderance of population accompanied by breeding in the winter rainfall areas, while during the summer months, the position was quite the reverse, the main mass of locusts being concentrated in the summer rainfall areas, *viz*: the Sind-Rajputana deserts, considerable breeding being, in addition, noticeable there. During the autumn months, numerous specimens of a freshly fledged generation of locusts were noted at Ambagh, Ormara, Pasni and Gwadar, and since breeding was entirely absent in the Lasbela and Mekran areas during the summer of 1935, there is little doubt that these locusts had probably migrated from the Rajputana desert areas. There is thus, on the whole, a considerable volume of evidence in favour of the migratory capabilities of the solitary-type of the desert locust.

(*ix*) *The practical value of the year's observations.*—This year's experience has shown that heavy winter rainfall in the Mekran areas may lead first to a general increase of the locust population on the coastal *reks*. Should further rainfall occur, especially in April and May in the hinterland, centres of breeding might come into existence in the interior giving rise to incipient swarms. The fliers resulting from these would be able to reach some parts of North-West India in the summer and should the rainfall be favourable, might multiply in such numbers as to start a new cycle of infestation. The best way of preventing such outbreaks would appear, therefore, to be the early detection and destruction of such incipient swarms in the Mekran area.

Observations made during the year under report have also shown that, in many cases, even solitary locusts can go through two successive generations in the year by their ability to reach distant breeding grounds situated n different rain-belts at the right time for breeding.

(*x*) *Study of old Records.*—The study and compilation of old records was continued. Mapping of the locust movements during the years 1926 to 1930 was attended to and copies of maps were made.

During the year, a study of the data contained in the Bombay Government Gazette from 1869 onwards was made. As in many of the season reports, the data of certain years referred indiscriminately to swarms of the Desert Locust as well as of the Bombay Locust, they were differentiated as far as possible by a close study of the details.

The *Bombay Locust* appears to have had its periods of increase and decline, just like *Schistocerca,* but the factors controlling its multiplication and development are apparently very different. The Bombay Locust goes through only one generation during the year, and the breeding commences only after the first fall of the monsoon showers. The building up of its numbers is, therefore, a much slower process, and is evidently dependent on the occurrence of a succession of favourable years.

From the data available, the *Bombay Locust* would appear to have had two great cycles of multiplication since 1872. Although swarms have been recorded during the year 1873-75, and 1877-79, the first great outbreak occurred during the years 1881-84. The next cycle began about 1897, but the actual outbreak lasted from 1901 to 1908, the peak being reached during the years 1902 to 1904. Since 1908, however, there has been no general outbreak, although a few swarms have been reported in certain years in some of the districts of the Bombay Presidency. It should be interesting to investigate fully into the causes underlying the quiescence of this locust since 1908, especially because this species resembles, in many of its general characters of its habits and life-cycle, the Red Locust—*Nomadacris septemfasciata*—that is at present active in Central and South Africa.

16. *Locust Committee.*—This committee which was appointed in 1930 and reconstituted in 1935, meets annually for the purpose of reviewing the progress of Locust Research and the locust position in India and abroad. The last meeting of the Committee took place in New Delhi on the 20th and 21st January 1936. The present composition of the Committee is as follows :—

1. Vice-Chairman, Imperial Council of Agricultural Research (Chairman *Ex*-officio).
2. Agricultural Expert, Imperial Council of Agricultural Research.
3. Director of Agriculture, Punjab.
4. Entomologist to Government, United Provinces.
5. Entomologist to Government, Punjab.
6. Imperial Entomologist, Imperial Institute of Agricultural Research.
7. The Agricultural Officer, North-West Frontier Province.

Secretary, Imperial Council of Agricultural Research (Secretary *Ex*-officio).

17. *Locust Research Scheme at Lyallpur.*—Since the 1st April 1933, the Council has made annual grants to the Government of the Punjab for research into the Biology and Bionomics of the Desert Locust, under the supervision of the Government Entomologist at Lyallpur. In September 1935, the Governing Body approved of these grants for a further period of three years with effect from the 1st April 1936 at a total cost of Rs. 19,552.

18. *Fourth International Locust Conference.*—On the invitation of the Egyptian Govermment the 4th International Locust Conference was held on the 14th April 1936 and succeeding days at Cairo. On the recommendation of the Locust Committee of the Imperial Council of Agricultural Research, Khan Bahadur Mian Afzal Husain, Entomologist to Government, Punjab, who has been closely connected with the Council's Locust research work represented India at the Conference.

19. *Agricultural Marketing.*—During the year, marketing survey work in respect of rice, wheat, linseed, groundnuts, tobacoo, fruits, milk, eggs, live-stock, hides and skins co-operative marketing and markets and fairs was commenced by the Central and local Marketing Staff in the provinces and Indian States under the direction of the Agricultural Marketing Adviser to the Government of India. The Office of the Agricultural Marketing Adviser was constituted with effect from 1st January 1935, but it was not until March of that year that the Central Marketing Officers and the Senior Marketing Officers in the provinces and Indian States had joined. During the earlier part of the year under review the rest of the provinces and most of the major Indian States appointed their marketing staffs and by the end of September, 92 full-time marketing officers were operating throughout India and Burma. Of these 32 were provided in the provinces out of grants made by the Imperial Council of Agricultural Research, 12 were appointed by the local Governments and 29 by the Durbars of the major Indian States. In addition to this full-time staff, 223 officers were nominated to deal with marketing in the smaller Indian States and Minor Administrations. Towards the close of the year the Coffee Cess Committee arranged to appoint a marketing officer for Coffee and this officer was temporarily attached to the office of the Agricultural Marketing Adviser.

A programme of marketing surveys was carried out on the basis of the draft synopses and questionnaires passed by a Joint Conference of the Central Marketing Officers and the Senior Marketing Officers of the provinces and Indian States held in Delhi. Over 800 copies of the proceedings were distributed to the parties concerned.

Rules for the guidance of Marketing Officers, the issue of which was agreed to by the Joint Conference were also circulated to local Governments and have been generally adopted by them. These were published along with a list of Marketing Officers.

In agreement with the respective Governments the local Marketing Staff in the provinces and major States undertook marketing survey work in respect of those Minor Administrations and States which adjoin or fall within their borders. The number of such States is approximately 120, leaving 210 minor States and Administrations to be dealt with by the Central Marketing Staff

direct. There remains outstanding a number of very small States whose trade is not sufficiently significant to warrant special marketing investigation.

In carrying out marketing surveys, and for eliciting primary facts, reliance has been placed on personal interviews by Marketing Officers, assisted by a standard list of questions as set out in the Proceedings of the Delhi Conference. There seems no alternative to this method when the information desired is complex and there is reluctance or indifference on the part of the informants, who are not likely to give detailed information of any value till their confidence has been secured and they are satisfied regarding the object of the particular enquiry. Their assistance and cooperation cannot generally be secured until the Marketing Officer has made himself intimately acquainted with the personnel and practice of the market place, and until he shows a real practical knowledge of the physical characteristics of the products with which he is concerned.

Apart from personal interviews the enquiries are supplemented by means of correspondence and questionnaires in cases where it is desirable to obtain statistical information from certain groups of persons, so long as they are reasonably limited in number—for example, exporters, millers or other manufacturers—but generally in such cases the ground has first of all to be covered by means of personal interviews.

The surveys include also the summarising, checking and utilising of secondary information collected by other agencies, for example, official statistics, international and railway statistics, and also statistics provided by various Chambers of Commerce and Trade Associations.

In practice the marketing surveys are carried out by the Marketing Officers visting the centres of concentrated production and also those areas where production is relatively sparse. As a general rule they begin at the producing end and work up gradually to the chief consuming centres. In all areas they interview representative members of different groups of persons concerned in the production and distribution of the commodity affected, for example, producers, wholesalers, manufacturers, railway agents, etc. Each Marketing Officer is responsible for making sure that the sample interviews are suitably representative of all the different groups of persons engaged in the chain of distribution.

Since the main object of the whole enquiry is to secure better prices for the producer a considerable amount of attention must be devoted to ascertaining—from merchants' books and other records—the correct prices obtained by producers and also the prices paid by the ultimate consumer. Not only is it necessary for average prices to be studied in producing and consuming centres, but also the seasonal and periodic movement in the prices. The general price structure has to be analysed by sampling, in each district, a number of representative consignments on the way from producer to consumer so as to see what part of the price margin goes in market charges, merchants' commissions, transport costs, etc. Prices must naturally be associated not only with a certain quantity but also with a certain quality of produce. A price quotation which does not refer to a specific grade or quality of produce is valueless for comparative purposes. Where a commercial description is

used to indicate quality, it is essential to know in what sense the description is applied in different markets. It is for that reason that headquarters work on grade standards has been mainly devoted to an analytical examination of thousands of commercial samples of oilseeds, cereals, tobacco, etc., drawn from different parts of India.

During the year under review marketing survey work in respect of the commodities referred to was commenced by all the local Marketing Staffs in the Provinces and States. The progress made month by month was reported to the Agricultural Marketing Adviser and submitted to the Imperial Council of Agricultural Research Department. The amount of ground covered before the end of the year depended naturally to a large extent on the date of appointment of the Marketing Staff in each case. In the latter months the local Staffs in the Provinces and States were interviewing altogether about 3,000 persons a month in addition to their other work of preparing reports, compiling statistics, preparing crop and stock maps, etc.

The Central Marketing Officers operated in Delhi Province for a month in order to learn marketing survey technique, and a draft report in respect of each commodity was prepared. They later visited the chief ports to study the export and import trade and paid visits to all the provinces and major States in order to consult with and assist the local Marketing Staffs in their surveys. In addition they visited 78 Indian States and Minor Administrations to carry out survey work locally. Altogether the Officers of the Central Marketing Staff spent 2,644 days on tour in the course of the year. Before the end of the year the Central Marketing Staff had compiled most of the statistical data regarding the export and import trade and prepared the first rough draft of the introductory sections of the all-India reports on each commodity.

So far as headquarters work on grade standards was concerned, arrangements were made in the course of the year for the analysis of commercial samples of linseed to be carried out by the Harcourt Butler Technological Institute, Cawnpore. Similar work for groundnuts was undertaken by the Oilseeds Specialist, Government of Madras at Coimbatore. Arrangements were made for the analysis of wheat at the Punjab Agricultural College, Lyallpur, and for tobacco at headquarters in conjunction with the Imperial Institute of Agricultural Research. The Rice Research Officers in the Province undertook to do the physical analysis of paddy and rice, but certain special work on cooking quality was assigned to the Research Officers at Dacca and Coimbatore. In January 1936 arrangements were made with a firm of tanners to carry out tanning tests on wet salted cow and buffalo hides collected by the Marketing Staff in various provinces and States, and with shippers at Calcutta and Karachi for the analysis of hides and skins arriving from different districts on the basis of the Hamburg system of classification.

Grain and oilseeds were analysed for refraction (*i.e.*, percentage of impurities, etc.). A chemical analysis of oil and water content was made in

the case of oilseeds and cooking tests applied in the case of rice. Tobacco samples were being examined and classified according to various quality factors, *i.e.*, colour, texture, etc.

Upto the end of February 1936, 1,219 commercial samples of wheat had been sent in by Marketing Officers to be analysed at Lyallpur. 710 samples of linseed were received and analysed by the Harcourt Butler Institute, 335 samples of groundnuts by the Oilseeds Specialist, Coimbatore. 545 samples of tobacco were received for analysis at headquarters. Altogether at different centres 1,177 samples of rice and paddy had been received of which 929 had been analysed.

By the end of the year preliminary marketing survey reports in respect of various commodities had been received as follows :—

Commodity.	No. of provinces.	No. of major States.
Wheat	3	2
Rice	..	..
Groundnuts	2	..
Linseed	3	2
Tobacco	2	1
Fruits	3	3
Milk	1	..
Poultry and Eggs	2	2
Livestock	..	..
Hides and skins	..	..
Total ..	16	10

The latest progress reports received from the local Marketing Staffs indicated that the survey work in most cases was proceeding according to programme.

20. (*a*) *Medicinal Plants.*—The scheme of investigation on the systematic cultivation of medicinal plants and study of food poisons in India, by Lieutenant-Colonel R. N. Chopra of the School of Tropical Medicine, Calcutta, was described in the last annual report. Work was started early in 1935-36 and the first progress report is awaited.

In accordance with a recommendation of the Advisory Board in August 1933 there were published in the Indian Journal of Agricultural Science (February 1935) :—

(*i*) A list of important indigenous drugs which grow or are cultivated in India for which there is a good market ;

(*ii*) A list of Pharmacopœial drugs, and substitutes, grown in India.

It is hoped that these will be of use to Local Governments and to institutions and individuals interested in medicinal plants.

In February 1936 at the instance of the Government of Madras, the Advisory Board discussed the question as to what action could usefully be taken provincially on the recommendation of the Drugs Enquiry Committee 1933, *viz.* that every encouragement should be given to promote the cultivation of medicinal plants and herbs. The following recommendations made by the Board are now under consideration :—

(*i*) That enquiries should be made regarding the state of the demand in India for medicinal drugs as the Medical Stores Depots and the various Ayurvedic and Unani Institutions may be in a position to furnish the required particulars.

(*ii*) That a survey of medicinal plants cultivated by ryots should be undertaken by provincial Governments.

20. (*b*) *Investigation of Indian Fish Poisons and other forest products for their insecticidal properties.*—This is a short-term (two years) scheme and the Government of Mysore have submitted a brief progress report on the work done during 1935. A more detailed report is expected for 1936.

21. *Standing committees for Rice and Wheat.*—The two committees were finally constituted on the lines recommended by the Crop-planning Conference, 1934, after consultation with the Government of India, the local Governments, constituent States of the Council and other interests concerned. The personnel of the committees is given in appendix IV.

22. *International Institute of Agriculture, Rome.*—As in previous years the High Commissioner for India, London, represented the Council on the Permanent Committee of the Institute. The next biennial meeting of the General Assembly is expected to take place in October 1936.

23. *The Imperial Botanical Conference (Cambridge—August 1935) and the International Botanical Congress (Amsterdam—September 1935).*—India was represented at these conferences by large and representative delegations (Appendix V). Of the subjects discussed at the Imperial Botanical Conference those of most interest to India were :—

(*i*) Fruit storage and transport problems, papers regarding which have been circulated to the appropriate sub-committee of the Advisory Board.

(*ii*) The collection and classification of crop varieties in regard to which the Conference adopted the following resolution—"That this Conference considers the collection and classification of crop and pasture varieties of the highest scientific importance and suggests that the matter be referred to the Imperial Scientific Conference in order that the matter may be organised on an Empire basis"; the subject will be considered at a forthcoming meeting of the Advisory Board when the maintenance of collections of crop varieties at various centres in India will be discussed.

(*iii*) Pasture research.

(*iv*) Succession of tropical forest types including application of ecological methods to tropical agriculture;

(*v*) Exchange of Botanical Staff between constituent parts of the Empire.

As regards the International Botanical Congress, the discussions were primarily of a scientific and technical nature and no matters of policy were discussed. The Indian delegation was particularly interested in the disscussions on cytology and genetics a brief statement of which is given below :—

The cytogenetical topics discussed included the following important aspects of chromosome study :

(*i*) The structure of the chromosome and the nucleus. Papers by Drs. Gregoire, Heitz, Lewitsky and Wrinch.

(*ii*) The mechanism of crossing-over :—

(*a*) Crossing-over in relation to the internal mechanics of the chromosomes—by Dr. C. D. Darlington.

(*b*) Chromosome structure and behaviour in relation to crossing-over—by Professor K. Sax.

(*iii*) Pairing of chromosomes in hybrids and heteroploids :—

(*a*) Secondary association of chromosomes—Mr. W. J. C. Lawrence.

(*b*) Unequal chromosomes in the bivalents of plant hybrids—Dr O. Meurman.

(*iv*) Abnormal karyological processes.

(*a*) Inherited abnormalities of meiosis in Zea Mays.

(*b*) Disposition and behaviour of pairing segments in *Oenothera*.

(*c*) Cytological analysis of evolution in *Biscutella*.

(*d*) Nature and signifiance of chromosomal transformations induced by high frequency radiation—T. H. Goodspeed.

Problems relating to

(*i*) The genetics and breeding of immune varieties,

(*ii*) Inbreeding and incompatibility,

(*iii*) Lethal factors,

and of the species concept in the light of modern research were discussed by the section of Genetics.

24. *The fifth Triennial Congress of the International Society of Sugarcane Technologists.*—This was held at Brisbane (Queensland—Australia) from the 27th August to the 3rd September 1935, and Rao Bahadur T. S. Venkataraman, Imperial Sugarcane Expert, Coimbatore, was the delegate from India. The Congress was divided into two main sections, manufacturing and agricultural. In the former, a special feature was " Sugar Boiling with particular reference to the refining quality of raw sugar," including topics such as plant, equipment and performance, graining methods, massecuite systems, control methods, boiling and crystallisation of low grade massecuites. In the agricultural section the special feature was a combined discussion of plot technique. Special discussions were also arranged on laboratory methods for the determination of soil fertility, irrigation and drainage, mechanical cultivation and maturity testing. There were also separate sub-sections on Entomology

and cane diseases, virus diseases and quarantine, as well as cane varieties. With this visit was combined a visit to Java where Rao Bahadur Venkataraman visited the Experiment Station at Pasoeroean where very important cane breeding work is being done and certain other important centres. A brief report on these visits will shortly appear in the Agriculture and Live stock in India.

25. *Fourth Imperial Entomological Conference.*—This Conference was held at London from the 19th to the 27th September 1935. Two officers on leave, *viz*, Mr. P. B. Richards, Entomologist to the Government of the United Provinces and Mr. J. C. M. Gardner of the Forest Research Institute, Dehra Dun, were the official delegates from India. (Mr. P. V. Isaac, Second Imperial Entomologist at the Imperial Institute of Agricultural Research who was also in London at the time, was prevented by illness, from attending.)

The Conference discusesd the need for the continuance of Empire support to the Imperial Institute of Entomology. The Farnham House Laboratory for the breeding and supply of beneficial parasites and the laboratory at Slough for investigations on stored products. A list of the Resolutions adopted at the Conference is appended (Appendix VI).

In accordance with the recommendations of the Conference a proposal for the temporary continuance of India's contribution to the Farnham House Laboratory and the Investigations at Slough on Stored Products has been sanctioned.

26. *Publications.*—(*a*) *Journals.*—The Council's two bimonthly Journals 'Agriculture and Livestock in India' and the 'Indian Journal of Agricultural Science,' and the quarterly 'Indian Journal of Veterinary Science and Animal Husbandry', entered their sixth year of life during the year under report. The number of original articles published in 'Agriculture and Livestock in India' was fifty-five, of which forty-one related to soils and crops and fourteen to animal husbandry subjects. A general desire having been expressed that this journal should cater more for the needs of the practical farmer, a step in this direction was taken during the year by arranging for a series of popular articles on various agricultural and animal husbandry subjects of general interest. The following articles in this series appeared during 1935-36 :—

(*i*) Manures and manuring.

(*ii*) Recent progress in fruit growing in India and abroad.

(*iii*) Recent advances in plant breeding.

(*iv*) Combating insect pests.

(*v*) The effect of management on the Milk Yields of Dairy Cattle in India.

(*vi*) A Note on the most practical methods of control of entozoal parasites in India.

(*vii*) A Note on eht most suitable Fodder Crops for livestock in Northern India.

In 'The Indian Journal of Agricultural Science' fiftytwo original contributions were published, of which nineteen may be classed as botanical, seven as chemical, one as entomological, seven as statistical and eighteen dealt with plant diseases. In addition, six abstracts and seven research notes were published. Of the twenty-four original articles which appeared in 'The Indian Journal of Veterinary Science and Animal Husbandry', twelve dealt with animal diseases, eleven with animal nutrition and one with dairying. Arrangements have been made to include in this journal abstracts of articles selected from foreign journals which are likely to be of use to Indian field workers. The number of abstracts published during the year was six.

(*b*) *Monographs, Bulletins, etc.*—The following Scientific Monographs and Miscellaneous Bulletins of the Imperial Council of Agricultural Research were published during the year :—

Scientific Monograph No. 10.—The spotted Boll-worms of Cotton, *Eraias-fabia* Stoll and *Erias insulana* Boisd. in South Gujarat, Bombay Presidency,' by Messrs. B. P. Deshpande, M.Ag., and N. T. Nadkarny, B.Ag. (Final report on the Indian Central Cotton Committee's Research Scheme).

Miscellaneous Bulletins.—

No. 5.—List of Publications on Indian Entomology for 1933, by the Officiating Imperial Entomologist, Pusa.

No. 6.—Bee-keeping, by C. C. Ghosh, B.A., F.R.E.S. (Revised edition of Pusa Bulletin No. 46).

No. 7.—List of Publications on Indian Entomology for 1934, compiled by the Officiating Imperial Entomologist, Pusa.

No. 8.—Selected Clinical Articles—

(*i*) An interesting Outbreak of *a Variola Vaccinia* in Milch Cattle at Lahore, by G. K. Sharma, G. P. V. C.

(*ii*) An unusual case of Navicular Disease, by R. L. Kaura, B.V.Sc., M.R.C.V.S.

(*iii*) Supernumerary Teats in Buffalo-cows, by G. K. Sharma, G.P.V.C.

The following Miscellaneous Bulletins were in the press at the end of the year :—

No. 9.—Statistical Methods and their Application to Agronomy—A Bibliography, by K. K. Guha Roy.

No. 10.—Diseases of Sugarcane and Methods for their Control by L. S. Subramaniam.

No. 11.—Tables of Standard Errors of Mendelian Ratios, by Swarn Singh Purewal and P. Krishna Rao.

No. 12.—List of Publications on the Botany of Indian Crops, Part II, for the period of 1928-32, by R. D. Bose.

A text-book entitled 'Handbook of Statistics for use in Plant-breeding and Agricultural Problems', by Dr. F. J. F. Shaw, was sent to the press during the year. This book was compiled in response to a request from the Advisory

Board of the Council, and is intended to provide a guide for students in Indian Universities and Agricultural Colleges and for research workers in Agricultural Departments, in the application of statistical methods to agricultural experiments.

A list of Publications of the Imperial Council of Agricultural Research is appended (appendix VII).

(*c*) *Supply of publications.*—The following table shows the number of copies of the Council's publications distributed :—

Name of the periodical.	Supplied as exchanges.	Number sold.	Number distributed free.
Agriculture and Livestock in India ..	406*	227	117
The Indian Journal of Agricultural Science	336*	183	48
The Indian Journal of Veterinary Science and Animal Husbandry	172*	146	50
Scientific Monographs and Miscellaneous Bulletins	182*	47	16

The system of reciprocal free exchanges among the various agricultural and veterinary departments in India continued to function satisfactorily, and about 150 copies each of the Council's publications were distributed under this arrangement. This system has undoubtedly made it easier for agricultural and veterinary officers and their assistants in the various provinces to keep in touch with work done elsewhere.

The following classified statement shows the number of institutions in India and abroad which receive Council's publications either free or on exchange basis—

1. Number of exchange institutions in India			164
2. Number of exchange institutions abroad :—			
(*a*) *British Empire*—			
Great Britain	40		
Canada	6		
Australia	5		
New Zealand	4		
Ceylon	4		
South Africa	12		
Total	71		
(*b*) Africa	14		
(*c*) Russia	12		
(*d*) Continent of Europe	24		
(*e*) China	5		
(*f*) Japan	3		
(*g*) United States of America	25		
(*h*) Other countries	29		
Grand Total	183		

*Includes copies distributed by the Director, Imperial Institute of Agricultural Research, Delhi.

3. Number of scientific institutions in India receiving free copies (other than as exchanges)	7
4. Number of scientific institutions abroad receiving free copies other than as exchanges	25
5. Number of Newspapers, and Periodicals in India receiving free copies	75

In making free supplies to institutions abroad attention has been paid to the requirements of Indian students abroad.

A large number of requests from scientific workers and others for individual publications and articles have been complied with, the free supply of 'separates' of individual papers in the journals, instead of the journal itself, proving a convenient solution in many instances.

A limited supply of back numbers of the older publications of the Imperial Department of Agriculture, has been offered free to the general public on condition that the indentors bear the cost of packing and postage. Many institutions in the country have availed themselves of this opportunity of completing library sets.

(*d*) *Editorial Committee and referees.*—Professor P. K. Parija, M.A., I.E.S., Ravenshaw College, Cuttack, served as University member on the Editorial Committee. As in previous years the Editorial Committee was greatly assisted by many honorary specialist referees in the examination of the papers offered for publication. The number of such referees during the year was seventy-four, and the Council takes this opportunity of placing on record its sincere appreciation of their services, without which it would not have been possible to maintain the present standard of its publications.

27. *Library.*—The Library has developed considerably within the last five years and now houses over 15,000 volumes connected with the science of agriculture. 1,563 books and 1,056 pamphlets and bulletins were added during 1935-36. No less than 286 periodicals are received from various parts of the world. Books, bulletins and records received as library exchanges totalled 2,255 as against 1,796 during the previous year, while the number of periodicals thus received increased from 135 to 167. The details of the exchange relations with the various countries are given in Appendix VIII. Special thanks are again due to the United States Department of Agriculture and the various state experiment stations for a generous free supply of their publications.

The Library subscribes for 104 journals and receives 167 in exchange. A list of the important periodicals received is given in Appendix IX. The following back-numbers of important publications were acquired during the year :—

1. Review of Applied Entomology (London) Series 'A' Vols. 1—18.
2. Review of Applied Entomology (London) Series 'B' Vols. 1—18.
3. Agricultural News (B. W. I) Vols. 1—13.
4. Experiment Station Record (U. S. A.) Vols. 1—19 and 21.
5. Ultana Lantbruksinstitut Redogorelse for Verksamheten (Sweden). 1893—1932.

6. Alnarps Lantbruksinstitut Arsskrift (Sweden). 1920—32.

7. Kungl. Lantbruksstyrelsens Berattelse (Sweden). 1900—1922, 1924, 1925, 1927—1931, 1933.

8. Statistisk Arsbok (Sweden). 1918, 1919, 1922—1931.

9. Bulletins issued by various Divisions of the department of Agriculture, Sweden. 6 Series.

The number of books issued from the Library showed an increase from 1,391 to 1,871 ; the number of periodicals sent out for circulation has increased to 3,054. All possible facilities are afforded to students who wish to use the Library. About 4,000 catalogue cards have already been typed out for the Library set of the card catalogue and entries for all publications received upto 31st December 1935 have been incorporated in the supplement. It is proposed to issue supplementary lists of additions to the Library every quarter. The printed Library catalogue is now complete and the first annual supplement is shortly to go to the Press.

The Council's Library keeps a file of the translations of foreign papers by the Imperial Agricultural Bureaux. It has, so far, received 273 summaries and translations from the Imperial Bureau of Plant Genetics, Cambridge. Of this number 42 were printed and distributed to research workers on the Bureau's distribution list. 21 papers were lent out during the year 1935-36. The conditions for the loan of these translations are :—

(*i*) The papers are the property of the Imperial Bureau and may be called back by the Council whenever required.

(*ii*) Reproduction in full or in part is strictly forbidden for reasons of copyright.

28. *Accounts.*—A statement of audited accounts of the Council for 1935-36 is given in appendix X.

29. *Scientific and technical officers.*—A list (appendix XI) of scientific and technical officers paid from the research grants of the Imperial Council of Agricultural Research as on the 31st March 1936 is appended.

N. C. MEHTA,
Secretary,
Imperial Council of Agricultural Research.

APPENDIX I.

Imperial Council of Agricultural Research, Governing Body.

1. The Hon'ble Kanwar Sir Jagdish Prashad, Kt., C.S.I., C.I.E., O.B.E., Chairman, Imperial Council of Agricultural Research.
2. Sir Bryce, Burt Kt., C.I.E., M.B.E., I.A.S.
3. The Hon'ble Minister for Agriculture, Madras Presidency, Madras.
4. The Hon'ble Minister for Agriculture, Bombay Presidency, Secretariat, Fort, Bombay.
5. The Hon'ble Minister for Agriculture, Bengal, Secretariat, Calcutta.
6. The Hon'ble Minister for Educatoin, United Provinces, Secretariat, Lucknow/Naini Tal.
7. The Hon'ble Minister for Agriculture, Punjab, Secretariat, Lahore/Simla East.
8. The Hon'ble Minister for Agriculture, Burma, Secretariat, Rangoon.
9. The Hon'ble Minister for Agriculture, Bihar and Orissa, Patna/Ranchi.
10. The Hon'ble Minister for Agriculture, Central Provinces, Nagpur/Pachmarhi.
11. The Hon'ble Minister for Agriculture, Assam, Secretariat, Shillong.
12. The Hon'ble Minister for Agriculture, North-West Frontier Province, Peshawar.
13. The Revenue Member to the Government of H. E. H. the Nizam of Hyderabad, Commerce and Industries Department, Hyderabad, Deccan.
14. The Member in charge of Agriculture, Mysore Executive Council, Bangalore.
15. The Member in charge of Agriculture, Baroda Executive Council, Baroda.
16. The Diwan of Cochin, Ernakulam.
17. The Diwan of Travancore, Trivandrum.
18. The Revenue Member, Bhopal State Council, Bhopal.
19. The Hon'ble Sir Frank Noyce, K.C.S.I., C.B.E., I.C.S., Member of the Governor General's Executive Council, in charge of Industries and Labour Department.
20. The Hon'ble Diwan Bahadur G. Narayanaswami Chetti Garu, C.I.E., Gopathy Villa, San Thome, Madras—Representative of the Council of State.
21. Pandit Sri Krishna Datt Palival, M.L.A., " Sainik Office ", Agra.
22. Mr. Mohd. Azhar Ali, M.L.A.

    } Representatives of the Legislative Assembly.

23. Sir Joseph Kay, Kt., C/o Messrs. W. H. Brady & Co., Ltd., Royal Insurance Buildings, Churchgate Street, Fort, Bombay, Representative of the Associated Chambers of Commerce of India.
24. Mr. Chunilal B. Mehta, 51 Marwari Bazar, Bombay 2, Representative of the Federation of Indian Chambers of Commerce and Industry.
25. Mr. P. J. Kerr, M.R.C.V.S., I.V.S., Director, Civil Veterinary Department and Veterinary Adviser to the Government of Bengal, Calcutta.
26. Mr. P. H. Carpenter, Chief Scientific Officer, Indian Tea Association, Tocklai Experimental Station, Cinnamara P. O. (Assam).

    } Representatives of the Advisory Board.

27. Diwan Bahadur Sir T. Vijayaraghavacharya, K.B.E., (Additional Member).

APPENDIX I—*contd.*

Imperial Council of Agricultural Research—Advisory Board.

1. The Vice-Chairman, Imperial Council of Agricultural Research.
2. The Agricultural Expert, Imperial Council of Agricultural Research.
3. The Animal Husbandry Expert, Imperial Council of Agricultural Research.
4. A. M. Livingstone, Esq., Agricultural Marketing Adviser to the Government of India.
5. The Director, Imperial Institute of Agricultural Research, Civil Lines, Delhi.
6. The Director, Imperial Institute of Veterinary Research, Muktesar (Kumaon).
7. The Director, Indian Institute of Science, Bangalore.
8. The Director of Agriculture, Madras.
9. The Director of Agriculture, Bombay Presidency, Poona.
10. The Director of Agriculture, Bengal, P. O. Ramna, Dacca.
11. The Director of Agriculture, United Provinces, Lucknow.
12. The Director of Agriculture, Punjab, Lahore.
13. The Director of Agriculture, Burma, Rangoon.
14. The Director of Agriculture, Bihar and Orissa, Patna.
15. The Director of Agriculture, Central Provinces, Nagpur.
16. The Director of Agriculture, Assam, Shillong.
17. The Agricultural Officer, North-West Frontier Province, Taru Jabba, Via Peshawar.
18. Mr. P. T. Saunders, O.B.E., M.R.C.V.S., I.V.S., Director of Veterinary Services, Madras.
19. Mr. E. S. Farbrother, M.R.C.V.S., I.V.S., Director of Veterinary Services, Bombay Presidency, Poona.
20. Mr. P. J. Kerr, M.R.C.V.S., I.V.S., Director, Civil Veterinary Department and Veterinary Adviser to the Government of Bengal, Calcutta.
21. Mr. T. J. Egan, I.V.S., Director, Civil Veterinary Department, United Provinces, Lucknow.
22. Mr. T. F. Quirke, M.R.C.V.S., I.V.S., Director of Veterinary Services, Punjab, Lahore.
23. Mr. D. T. Mitchell, M.R.C.V.S., Director of Veterinary Services, Burma, Rangoon.
24. Major P. B. Riley, I.V.S., Director of Veterinary Services, Bihar and Orissa, Patna.
25. Rai Bahadur R. V. Pillai, Director of Veterinary Services, Central Provinces, Nagpur.
26. Rai Sahib Srish Chandra Ghosh, G.B.V.C., Office of the Superintendent, Civil Veterinary Department, Assam, Shillong.
27. S. M. A. Shah, Esq., M.R.C.V.S., Superintendent, Civil Veterinary Department, North-West Frontier Province, Peshawar.
28. The Director of Agriculture, H. E. H. the Nizam's Government, Hyderabad (Deccan).
29. The Director of Veterinary Department, H. E. H. the Nizam's Government, Hyderabad (Deccan).
30. The Director of Agriculture, Mysore State, Bangalore.
31. The Superintendent, Civil Veterinary Department, Mysore State, Bangalore.
32. The Director of Agriculture, Baroda State Baroda.

APPENDIX I—*contd.*

33. The Deputy Director of Agriculture, Baroda State, Baroda.

34. The Superintendent of Agriculture, Cochin State, Cochin.

35. The Senior Veterinary Inspector, Cochin State.

36. The Director of Agriculture and Fisheries, Travancore, Trivandrum.

37. The Director of Agriculture, Bhopal State, Bhopal.

38. The Director of Veterinary Services, Bhopal State, Bhopal.

39. The Director of Agriculture, Kashmir.

40. The Director of Veterinary Services, Kashmir.

41. Mr. A. M. Mustafa, Agricultural Officer, Baluchistan, Quetta,—Representative of minor administrations under the Government of India.

42. The Inspector General of Forests, Forest Research Institute, Dehra Dun,—Representative of the Forest Research Institute, Dehra Dun.

43. Diwan Bahadur T. Raghaviah, C.S.I., Cathedral P. O. Graeme's Road, Madras—Representative of the Cooperative Movement.

44. Lt.-Col. A. J. H. Russell, C.I.E., I.M.S., Public Health Commissioner with the Government of India (D.G., I.M.S.)—Representative of the Indian Research Fund Association.

45. Prof. C. N. Vakil, M.A., M.Sc., F.S.S., University Professor of Economics, Bombay University, Bombay.

46. Dr. T. Ekambaram, M.A., Ph. D., L.T., Professor, Presidency College, Madras.

47. Rao Bahadur C. Tadulinga Mudaliar, F.L.S., I/A, Sulivan Garden Road, Mylapore, Madras.

48. Dr. L. K. Hyder, Ph. D., C.I.E.

Representatives of the Inter-University Board.

49. Mr. P. H. Carpenter, Chief Scientific Officer, Indian Tea Association, Tocklai Experimental Station, Cinnamara P. O. (Assam)—Representative of the Indian Tea Association and the United Planters' Association of South India.

50. Rao Bahadur Bhimbhai R. Naik, M.L.C.,—Representative of the Sagrampura, Surat.

51. The Director of Veterinary Services in India, Q. M. G.'s Branch, Army Headquarters, Simla.

52. The Central Publicity Officer, Indian State Railways, Old Secretariat Buildings, Old Delhi.

53. The Chief Agricultural Officer, Sind, Karachi.

54. The Director, Industrial Intelligence and Research Bureau.

55. Maulvi Sir Mohammed Yakub, Kt., M.L.A., Moradabad.

56. Dr. Nazir Ahmad, M.Sc., Ph. D. (Cantab), Director, Technological Laboratory, Indian Central Cotton Committee, Matunga, Bombay.

57. Sir Chunilal V. Mehta, Kt., K.C.S.I., Neville House, Currimbhoy Road, Ballard Estate Bombay.

58. Dr. S. S. Nehru, M.A., Ph. D., I.C.S., Collector, Mainpuri (U. P.)

59. Rao Bahadur M. Vaidyanathan, M.A., L. T., Statistician, Imperial Council of Agricultural Research.

60. Sardar Datar Singh, Cattle and Dairy Farm, Montgomery.

61. Diwan Bahadur A. Ramaswami Mudaliar, Lander's Gate St., Vepery, Madras.

APPENDIX I—*concld.*

GOVERNMENT OF INDIA.

Imperial Council of Agricultural Research Department.

Hon'ble Member for the Imperial Council of Agricultural Research Department :—

The Hon'ble Kunwar Sir Jagdish Prasad Kt., C.S.I., C.I.E., O.B.E.

Sir Bryce Burt, Kt., C.I.E., M.B.E., B.Sc., I.A.S., officiating Vice-Chairman.

Mr. N. C. Mehta, B.A., Bar-at-Law, I.C.S., Secretary.

Colonel A. Olver, C.B., C.M.G., F.R.C.V.S., Animal Husbandry Expert.

Dr. F. J. F. Shaw, D.Sc., A.R.C.S., officiating Agricultural Expert.

Mr. A. M. Livingstone, M.C., B.Sc., Marketing Expert and Agricultural Marketing Adviser to the Government of India.

Mr. Bazlul Karim, Superintendent (on leave).

Mr. P. M. Sundaram, B.A., Superintendent.

Mr. T. S. Krishnamurthi, B.A., officiating Superintendent.

Research side.

Mr. R. C. Srivastava, B.Sc., Sugar Technologist.

Rao Bahadur Y. Ramachandra Rao, M.A., F.E.S., Locust Research Entomologist.

Rao Bahadur M. Vaidyanathan, M.A., L.T., F.S.S., Statistician.

Dr. Ramji Das Kapur, M.A., Ph. D., Chief Economist.

APPEND X II.

I.—List of urgent agricultural and animal husbandry schemes, to be financed during 1936-37.

	Estimated cost. Rs.
1. *Imperial Institute of Veterinary Research* :—	
Investigation of tuberculosis and Johne's disease among animals	1,25,000
2. *Imperial Institute of Agricultural Research* :—	
Tobacco research, Guntur sub-station	1,05,000
3. *Imperial Institute of Veterinary Research, Muktesar* :—Grant for investigation into contagious abortion in cattle, goats and sheep	53,000
4. Oilseed research schemes :—	
(*a*) Linseed Central Provinces 52,000	
(*b*) Linseed Bengal 21,000	
(*c*) Punjab-rape and mustard 36,000	
(*d*) Madras—Groundnuts 57,000	1,66,000
5. *Poultry* :—Grant for research into diseases of poultry (At Izatnagar)	40,000
*6. San Jose Scale survey in the Punjab (to prevent the pest spreading to other parts of the Punjab and of India)	22,000
7. *Bihar and Orissa* :—Investigations on the Feeding of minerals to cattle in Bihar and Orissa	25,000
8. United Provinces Schemes for determining the feeding values of certain food grains, oil-seeds and oil-cakes for working bullocks and dairy cattle	1,02,000
9. Fruit Research schemes to which funds have not been allotted but which form part of the co-ordinated whole :—	
(*a*) Assam 37,000	
(*b*) Central Provinces 71,000	
(*c*) Punjab 57,000	
(*d*) North-West Frontier Province 20,000	
	1,85,000
10. *Punjab* :—Grant for investigation of indigenous sheep-breeding in the Punjab	43,000
11. *Bombay* :—Scheme of research in poultry husbandry to be conducted in the Bombay Presidency	44,000
Total	9,10,000

*A Proposal for combining this scheme with the Entomological survey scheme in the N.-W. F. P. is under consideration.

APPENDIX II—*contd.*

II.—*Sugar Research Schemes.*

	1st year.	2nd year.	3rd year.	4th year.	5th year.	Total.
*1. Central Sugar cane Insect Pests Scheme	44,798	24,974	25,753	..	..	95,525
*2. Sugarcane breeding sub-station, Karnal	20,657	13,948	14,233	1,203	..	50,041
*3. United Provinces Sugarcane seedlings Scheme	3,126	526	526	526	526	5,230
*4. Dacca Seedling Testing Station ..	2,300	2,300	2,360	2,360	2,480	11,800
*5. Bihar and Orissa Sugarcane Research Scheme	26,000	26,000	26,000	26,000	26,000	1,30,000
6. Manufacture of cattle feed from Molasses	7,000	3,000	..	..	..	10,000
7. Research on the structural anatomy of the Sugarcane (Dr. Ekambaram's Scheme)	2,542	2,854	3,166	..	..	8,562
8. Chemistry of Sugarcane scheme ..	7,240	7,606	7,972	..	..	22,818
9. Application from Government of Baroda for investigation of suitable types of cane for Gujerat ..	3,644	1,824	1,884	1,944	2,004	11,300
10. North-West Frontier Province Sugarcane scheme	19,410	11,160	11,160	11,160	11,160	64,050
Total	1,36,717	94,192	93,054	43,193	42,170	4,09,326

*Renewals.

APPENDIX III.

Personnel of the Soil Science Committee.

1. The Vice-Chairman, Imperial Council of Agricultural Research—Chairman, *Ex-Officio.*
2. The Agricultural Expert, Imperial Council of Agricultural Research.
3. Mr. A. P. Cliff, Deputy Director of Agriculture, North Bihar Range, Muzaffarpur, Bihar and Orissa (*Agriculturist*).
4. Dr. J. K. Basu, Soil Physicist, Sugarcane Research Scheme, Padegaon, Bombay-Deccan.
5. Rao Bahadur B. Viswanath, F.I.C., now Imperial Agricultural Chemist, Imperial Institute of Agricultural Research, *Soil Chemist.*
6. Dr. P. G. Krishna, Agricultural Chemist to the Government of Hyderabad, *Soil Physicist.*
7. Dr. E. Mackenzie Taylor, M.B.E., Director, Irrigation Research, Punjab, *Soil Physicist.*
8. The Agricultural Chemist, Central Provinces, *Soil Bacteriologist.*
9. Dr. J. C. Ghosh, D.Sc., Head of the Department of Chemistry, Dacca University;—*Physical Chemist.*
10. Mr. P. H. Carpenter, Chief Scientific Officer, Indian Tea Association, Assam.
11. Dr. J. N. Mukherjee, D.Sc., Kaira, Professor of Chemistry, Calcutta University.
12. The Agricultural Chemist, Sind.
13. Dr. Nazir Ahmad, Director, Technological Laboratory, Indian Central Cotton Committee, Matunga, Bombay.

The Secretary, Imperial Council of Agricultural Research, Secretary, *Ex-officio.*

APPENDIX IV.

Personnel of the Standing Committees on Rice and Wheat.

I.—*Standing Committee on Rice.*

1. The Vice-Chairman, Imperial Council of Agricultural Research, Chairman, *Ex-officio.*

2. The Agricultural Expert, Imperial Council of Agricultural Research.

3. The Agricultural Marketing Adviser to the Government of India.

4. The Director-General, Commercial Intelligence and Statistics.

5. The Senior Marketing Officer, (Rice).

6. The Statistician, Imperial Council of Agricultural Research.

7—19. The Directors of Agriculture, Madras, Bombay, Bengal, United Provinces, Burma Bihar and Orissa Central Provinces, Assam, Hyderabad, Mysore, Baroda, Travancore and Cochin.

20. The Chief Agricultural Officer, Sind.

21—28. Eight representatives of rice growers, one each from Madras, Bombay, Bengal, United Provinces, Burma, Bihar and Orissa, Central Provinces and Assam.

Madras.—Zabdatul Aqram Srimat Raja Yarlagadda Sivarama Prasad Bahadur, Zamindar of Devarakotta (Chellapalli), President, District Board, Kistna, District Masulipatnam.

Bombay.—Mr. Govind Dharamaji Vatrak of Virar, District Thana.

Bengal.—Babu Mon Mohan Sinha Roy, Makalpur, District Hooghly.

United Provinces.—Rai Sahib Th. Bishbanath Singh Sahib, C/o Dr. S. B. Singh, Deputy Director of Agriculture, North East Circle, Gorakhpur.

Burma.—U. Ba Maung, K. S. M., Manager of the District Central Co-operative Bank, Pegu.

Bihar and Orissa.—Babu Ram Pal Singh, Nirmali (Bengal and North Western Railway).

Central Provinces.—Rai Bahadur Tundilal Powar, Malguzar of Tekadi near Balaghat.

Assam.—Srijut Mohendra Nath Gohain, M.A., B.L., M.L.C., Golaghat.

29. The Paddy Specialist, Madras.

30. The Crop Botanist, Bombay.

31. The Economic Botanist, Bengal.

32. The Economic Botanist (Rice), United Provinces.

33. The Rice Research Officer, Burma.

34. The Officer-in-Charge, Rice Research Station, Bihar and Orissa.

35. The Officer-in-Charge, Rice Research Station, Central Provinces.

36. The Economic Botanist, Assam.

37-38. Two Professors of Economics :—

Professor P. J. Thomas, Professor of Indian Economics, Madras University.

Dr. H. L. De, Reader in the Department of Economics and Politics, Dacca University.

39. Rai Upendra Lal Ray Bahadur, Parade Square, Chittagong, representing the Associated Chamber of Commerce.

40. Mr. Ashutosh Bhattacharyya, 69-/1, Chetla Road, Post Office Alipore, Calcutta, representing the Federation of Indian Chambers of Commerce and Industry.

41. One Wholesale Rice Merchant ,Mr. N. Rangaswami Reddyar, Rice Merchant, Kuttlam. Tanjore District.

APPENDIX IV—*contd.*

42. One Rice Miller, Mr. Addepalli Pamidiah, Secretary, Vijayavada Rice Mills Association. Bezwada, Kistna District.

43-44. Two trade representatives, one each from Madras and Bengal.

Madras.—K. P. V. S. Muhammad Meera Rowther Sahib Bahadur, M.L.C., Merchant and Agent, Negapatam.

Bengal.—Mr. M. A. Ispahani, President, Moslem Chamber of Commerce, Calcutta.

45. Mr. G. Howison, Messrs. Steel Bros. & Co., Ltd., Rangoon, representing wholesale exporters from Burma.

Secretary, Imperial Council of Agricultural Research, Secretary, *Ex-officio.*

II.—*Standing Committee on Wheat.*

1. The Vice-Chairman, Imperial Council of Agricultural Research, Chairman, *ex-officio*
2. The Agricultural Expert, Imperial Council of Agricultural Research.
3. The Agricultural Marketing Adviser to the Government of India.
4. The Director General, Commercial Intelligence and Statistics.
5. The Senior Marketing Officer (Wheat).
6. The Statistician, Imperial Council of Agricultural Research.
7. The Director, Imperial Institute of Agricultural Research.
8. The Second Economic Botanist, Pusa.

9—16. The Directors of Agriculture, United Provinces, Punjab, Bihar and Orissa, Central Provinces, North-West Frontier Province, Hyderabad, Baroda and Bhopal.

17. The Chief Agricultural Officer, Sind.

18—22. Five representatives of wheat growers, one each from the United Provinces, Punjab, Bihar and Orissa, Central Provinces and Sind.

United Provinces.—M. Abdul Rashid Khan Sahib, B.A., Rais, Khurja, Bulandshahr.

Punjab.—Mr. W. Roberts, C.I.E., Managing Director, British Cotton Growing Association, Khanewal.

Bihar and Orissa.—Babu Amir Chandra, Arrah, East Indian Railway.

Central Provinces.—Mr. Budha Ram Prasad Dube, Malguzar, Sawalkheda, Hoshangabad.

Sind.—Mr. Ghulam Mustafa Mirza, Shikarpur.

23. Crop Botanist, Bombay.
24. Cerealist, Lyallpur, Punjab.

25—27. Economic Botanists (Rabi cereal), United Provinces, Central Provinces and Sind.

28. Rust Research Officer (Dr. K. C. Mehta), United Provinces.
29. Professor B. P. Adarkar, B.A., Economics Department, Benares Hindu University, Benares.
30. Dr. L. C. Jain, Professor of Economics, Punjab Unversity.

APPENDIX IV—*concld.*

31. Mr. F. C. Fyffe, C/o Messrs. Shaw Wallace & Co., 4/5 Bankshall Street, Calcutta, representing the Associated Chambers of Commerce.

32. Mr. Rati Lal Mulji Gandhi, C/o Messrs. R. Rati Lal & Co., 4, Chinch Bunder Road, Bombay, 9, representing the Federation of Indian Chambers of Commerce and Industry.

33—36. Four representatives of Wheat Trade one each from Karachi, United Provinces, Punjab and Central Provinces.

Karachi.—Mr. Jamshed N. R. Mehta of Karachi, Steam Roller Flour Mills, Coy., Ltd., Karachi.

Punjab.—Mr. Mahanarain, Managing Director, Ganesh Flour Mills, Lyallpur.

United Provinces.—Lala Madhu Sudan Dayal, Grain Merchant, Hapur.

Central Provinces.—Mr. Kanhaiya Lal Rawat, B.A., LL.B., Itarsi, Hoshangabad.

Secretary, Imperial Council of Agricultural Research, Secretary, *Ex-officio.*

APPENDIX V.

Indian Delegation to the Imperial Botanical Conference, Cambridge (August 1935) and the International Botanical Congress, Amsterdam (September 1935).

IMPERIAL BOTANICAL CONFERENCE.

Mr. J. B. Hutchinson and Dr. (Miss) E. K. Janaki Ammal, representing the Imperial Council of Agricultural Research.

Mr. W. J. Jenkins, Chief Agricultural Officer in Sind.

Mr. D. G. Munro, Deputy Director of Agriculture, Madras.

Mr. D. Rhind, Economic Botanist, Burma.

Mr. M. Bashir, Assistant Registrar, Punjab University.

Mr. Birbal Sahni of the Lucknow University.

Messrs. Saksena and Naithani of the Allahabad University.

Mr. Hutchinson was the leader of the delegation.

INTERNATIONAL BOTANICAL CONGRESS.

Dr. W. Burns, Director of Agriculture, Bombay, Leader.

Mr. A. McLean, Deputy Director of Agriculture, Burma.

Mr. M. Bashir, Assistant Registrar, Punjab University.

Messrs. Saksena and Naithani of the Allahabad University.

Mr. J. B. Huthinson and Dr. (Miss) E. K. Janaki Ammal, representing the Imperial Council of Agricultural Research.

Professor S. P. Agharkar representing the National Institute of Sciences of India.

APPENDIX VI.

Imperial Entomological Conference, London, 1935.

RESOLUTIONS.

At the final meeting of the Conference on the 27th September, the following resolutions were unanimously adopted:—

1. The Conference records its appreciation of the services rendered by the Imperial Institute of Entomology to scientific workers in the British Empire and urges the importance of adequate support being given so as to enable those essential services to be continued on the same lines.

2. The Conference adopts the report of the Special Business Committee appointed at its first meeting and endorses the recommendations and suggestions contained therein.

3. The Conference adopts the following resolutions on Locusts and Grasshoppers, *viz*:—

(1) Recent researches in the locust and grasshopper problem suggest that their outbreaks usually originate in relatively restricted areas from which the pests gradually spread over vast regions.

(2) The most practical and cheapest way to the lasting solution of the locust and grasshopper problem is the organisation of investigations on every important species within the whole area of its distribution regardless of political boundaries, with a view to the discovery of its original outbreak areas, and the placing of these under permanent supervision in order to suppress incipient outbreaks.

(3) The Conference therefore recommends:—

(*a*) That an effective support should continue to be given to the international locust investigations in Africa and western Asia by the Government of all British territories concerned.

(*b*) That similar comprehensive investigations should be organised in other parts of the Empire suffering from locusts and grass-hoppers.

(*c*) That an exchange of reports, programmes of work, etc., should be established between all organisations working on the locust and grasshopper problem in the Empire.

(*d*) That the attention of the Governments of Dominons and Colonies suffering from locusts and grasshoppers should be drawn to the forthcoming Fourth International Locust Conference to be held in March 1936 at Cairo, and to the desirability of their being represented at that Conference.

4. The Conference adopts the resolutions prepared by the Committee on Termites, *viz*:—

The Conference views with great apprehension the very heavy losses due to termites, especially in the case of buildings, throughout the tropical and sub-tropical regions of the Empire. It also wishes to call attention to the very limited knowledge of the subject that is at present available. It therefore recommends that steps should be taken to accumulate information on this subject under the following heads:—

(1) An approximate estimate of the financial losses caused by termites:—

(*a*) to buildings;

(*b*) to agriculture;

(*c*) to the forest industry.

(2) The indentity and habits of the species involved.

APPENDIX VI—*contd.*

(3) Details of any investigations in progress in connection with the control of termites.

(4) Particulars of any methods of controlling termites that are in practice and appear to promise success.

It also recommends that this matter be taken up with the Governments concerned with a view to providing eventually for a thorough investigation of the whole problem.

5. The Conference wishes to tender its grateful thanks for the hospitality extended to it by His Majesty's Government in the United Kingdom, by the Trustees of the British Museum, and by the Royal Entomological Society of London, and in particular to the latter for the use of its Meeting Room and Library.

6. The conference wishes that its thanks be conveyed to Sir John Russell, F.R.S., Director of Rothamsted Experimental Station, to Mr. W. A. Robertson, Director of the Forest Products Research Laboratory and to Professor J. W. Munro for the welcome accorded to the delegates on their visits to Rothamsted, Princes Risborough and Slough, respectively, and for the interesting and instructive explanations of the work in progress at those research institutes.

7. The Conference endorses the opinion expressed at previous Imperial Entomological Conferences as to the value of periodical meetings of entomologists and recommends that steps be taken in due course for a Fifth Imperial Entomological Conference to be held in London in 1940, of which at least four months' notice should be given.

APPENDIX VII.

Publications of the Imperial Council of Agricultural Research.

1. Agriculture and Live-stock in India.

A bi-monthly Journal of Agriculture and Animal Husbandry for the general reader interested in Agriculture or Livestock in India or the Tropics. (Established 1931. Published in January, March, May, July, September and November. Prepayable subscription Rs. 6 or 9*d*. 9*d*. per annum inclusive of Indian postage. Price per part Rs. 2 or 3*s*. 6*d*. inclusive of Indian postage) Volumes I to V complete are available.

2. The Indian Journal of Agricultural Science.

A bi-monthly Scientific Journal of Agriculture and the allied sciences, mainly devoted to the publication of the results of original research and field experiments. (Established 1931. Published in February, April, June, August, October and December. Prepayable subscription Rs. 15 or 24*s*. per annum inclusive of Indian Postage. Price per part Rs. 3 or 5*s*. 3*d*. inclusive of Indian postage.) Volumes I to V complete are available.

3. The Indian Journal of Veterinary Science and Animal Husbandry.

A quarterly Journal for the publication of scientific matter relating to the health, nutrition and breeding of live-stock. (Established 1931. Published in March, June, September and December. Prepayable subscription Rs. 6 or 9*s*. 9*d*. inclusive of Indian postage. Price per part Rs. 2 or 3*s*. 6*d*. inclusive of Indian Postage). Volumes I to V complete are available.

4. Scientific Monographs of the Imperial Council of Agricultural Research.

NCAG—SM/1 No. 1 .. The Fungi of India, by E. J. Butler, C.I.E., D.Sc., M.B., F.R.S., and G. R. Bisby, Ph. D. (1931). Price Rs. 6-12-0 or 11*s*. (As. 8).

NCAG—SM/2 No. 2 .. Life-histories of Indian Microlepidoptera. Second Series: Alucitidae (Petrophoridae, Tortricina and Gelechiadae) by T. Bainbrigge Feltcher, R. N., F. L. S., F. E. S., F. Z. S. (1932). Price Rs. 3-4-0 or 5*s*. 6*d*. (As. 6).

NCAG—SM/3 No. 3 .. The Open Pan System of White-Sugar Manufacture, by R. C. Srivastava, B.Sc. (1935. 2nd edition). Price Rs. 3-2-0 or 5*s*. 6*d*. (As. 9).

NCAG—SM/4 No. 4 .. Life histories of Indian Microlepidoptera; Cosmopterygidae, to Neopseustidae, By T. Bainbrigge Fletcher, R. N. F.L.S., F.E.S., F.Z.S. (1933). Price Rs. 4-8-0 or 7*s*. 6*d*. (As. 8).

NCAG/SM/5 No. 5 .. The Bombay Grasses, By E. J. Blatter, S.J., Ph.D., F.L.S., and C. McCann, F.L.S. Illustrated by R. K. Bhide. Price Rs. 20-12-0 or 32*s*. 6*d*.

NCAG—SM/6 No. 6 .. Helminth Parasites of the Domesticated Animals in India, By G. D. Bhalerao, M.Sc. Price Rs. 7-12-0 or 13*s*. 3*d*.

NCAG—SM/7 No. 7 .. Influence of Manures on the Wilt Disease of *Cajanus Indicus* Spreng. and the isolation of Types Resistant to the Disease, By W. McRae, M.A., D.Sc. (Edin.). F.L.S., and F.J.F. Shaw, D.Sc. (Lond.)., A.R.C.S., F.L.S. (1933). Price Rs. 2-4-0 or 4*s*. 3*d*. (As. 5).

NCAG—SM/8 No. 8 .. The Silk Industry of Japan with Notes on Observations in the United States of America, England, France and Italy, By C. C. Ghosh, B.A., F. E. S. (1933). Price Rs. 4 or 6*s*. 9*d*.

APPENDIX VII—*contd.*

NCAG—SM/9 No. 9 .. Mechanical Cultivation in India. A History of the Large-Scale Experiments carried out by Burma-Shell Oil Storage and Distributing Company of India, Ltd., By C. P. G. Wade. Price Rs. 3-14-0 or 6*s.* 6*d.*

NCAG—SM/10 No. 10 .. Spotted Boll-worms in South Gujarat, by Messrs. B. P. Despande and N. T. Nadkarney. (In the press).

5. Miscellaneous Bulletins of the Imperial Council of Agricultural Research.

NCAG—MB/1 No. 1 .. List of Publication on Indian Entomology (1930). By the Imperial Entomologist, Pusa. Price As. 14 or 1*s.* 3*d.*

NCAG—MB/2 No. 2 .. List of Publications on Indian Entomology (1931), By the Imperial Entomologist, Pusa. Price As. 8 or 10*d.*

NCAG—MB/3 No. 3 .. List of Publications on Indian Entomology (1932). By the Imperial Entomologist, Pusa. Price As. 12 of 1*s.* 3*d.*

NCAG—MB/4 No. 4 .. Host Plant Index of Indo-Ceylonese Coccidae By S. Ramachandran, L. Ag. and T. V. Ramakrishna Ayyar, B.A., Ph.D., F. Z. S. Price Rs. 1-10-0 or 2*s.* 9*d.*

NCAG—MB/5 No. 5 .. List of Publications on Indian Entomology (1933). Compiled by the Officiating Imperial Entomologist, Pusa. Price As. 9 or 1*s.*

NCAG—MB/6 No. 6 .. Bee-keeping, By C. C. Ghosh, B.A., F.E.S. (3rd Edition, in the Press).

NCAG—MB/7 No. 7 .. List of Publication on Indian Entomology (1934). Compiled by the Officiating Imperial Entomologist and the Imperial Entomologist, Pusa. Price Rs. 1-2-0 or 2*s.*

Misc. Bull. No. 8 .. Selected Clinical Articles by Messrs. G. K. Sharma and R. L. Kaura. (In the Press).

Misc. Bull. No. 9 .. Statistical Methods and their Application to Agronomy. A Bibliography by K. K. Guha Roy (In the Press).

Misc. Bull. No. 10 .. Diseases of Sugarcane and Methods for their control. By L. S. Subramaniam. (In the Press).

Misc. Bull. No. 11 .. Tables of Standard Errors of Mendelian Ratio. By Swarn Singh Purewal and P. Krishna Rao (In the Press).

Misc. Bull. No. 12. .. List of Publications on the Botany of Indian Crops. Part II for the period 1928-32. By R. D. Bose. (In the press).

6. Annual Report of the Imperial Council of Agricultural Research.

NCAG—AR/31 .. Annual Report of the Imperial Council of Agricultural Research for the year 1929-30 and 1930-31. Price As. 12 or 1*s.* 3*d.* (Anna 1).

NCAG—AR/32 .. Annual Report of the Imperial Council of Agricultural Research for the year 1931-32. Price As. 6 or 8*d.* (As. 2).

NCAG—AR/33 .. Annual Report of the Imperial Council of Agricultural Research for the year 1932-33. Price As. 6 or 8*d.*

NCAG—AR/34 .. Annual Report of the Imperial Council of Agricultural Research for the year 1933-34.

Annual Report of the Imperial Council of Agricultural Research for the year 1934-35.

APPENDIX VII—*concld.*

7. Review of Agricultural Operations in India.

NCAG—R. 1/29 .. Review of Agricultural Operations in India. 1928-29. Price Rs. 3-2-0 or 5*s.* 6*d.* (As. 8).

NCAG—R. 1/31 .. Review of Agricultural Operations in India, 1929-31. Price Rs. 5 or 8*s.* 3*d.* (As. 10).

8. Proceedings of the Board of Agriculture and Animal Husbandry.

Proceedings of the First Meeting of the Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry held at New Delhi from the 20th to 23rd February 1933, with Appendices. Price Rs. 5-14-0 or 9*s.* 6*d.*

A Description of the Imperial Institute of Veterinary Research, Muktesar, and its sub-station, the Imperial Veterinary Serum Institute, Izatnagar, By F. Ware, F. R.C.V.S., Price Rs. 1-4-0 or 2*s.*

The Production of Cigarette Tobacco by Flue-curing By F. J. F. Shaw, D.Sc., A.R.C.S., F.L.S., and Kashi Ram. *Imp. Inst. Agri. Res. Pusa Bull.* No. 187. Reprinted (1935). Price Re. 1 or 1*s.* 9*d.*

A Hand Book of Statistics for use in Plant Breeding and Agricultural Problems, By Dr. F. J. F. Shaw, D.Sc., A.R.C.S., F.L.S., I.A.S. (In the Press).

(Copies of the above publications can be had from :—

In India.—Manager of Publications, Civil Lines, Delhi.

In Europe and America.—From Public Department (Publications Branch), Office of the High Commissioner for India, India House, Aldwych, London W.C. 2.

APPENDIX VIII.

Books and publications received as Library exchanges.

Name of countries.	Number of books, bulletins and reports received.	Number of periodicals received.
1. Afghanistan	..	1
2. Africa	62	6
3. Argentine	1	..
4. Australia	60	3
5. Austria	..	2
6. Belgium	1	1
7. Brazil	5	1
8. British Guiana	4	1
9. Canada	43	1
10. Ceylon	..	2
11. China	37	3
12. Cyprus	5	1
13. Czechoslovakia	1	1
14. Dutch East Indies	8	1
15. Fiji	4	1
16. France	4	2
17. Germany	9	6
18. Great Britain	347	29
19. Holland	20	..
20. India—		
(*a*) Local Governments	368	30
(*b*) Private bodies and States	71	29
21. Italy	37	4
22. Japan	1	5
23. League of Nations	69	7
24. New Zealand	5	2
25. Palestine	11	..
26. Phillippines	..	3
27. Romania	..	1
28. Russia	51	8
29. Straits Settlements and Malaya	14	6
30. Sweden	299	..
31. Switzerland	3	..
32. United States	711	7
33. West Indies	4	3
Total	2,255	167

APPENDIX IX.

List of Journals received in the Library, Imperial Council of Agricultural Research.

Agricultural Engineering.

1. Implement and Machinery Review (England). Vol. 55. (1930 to date).

Agriculture.

2. Agricultural Colonial (Italy). Vol. 28. (1934 to date).
3. Agricultural Sinica (China). Vol. 1. (1934 to date).
4. Agricultural Journal of British Guiana. Vol. 1. (1928 to date).
5. Agricultural Journal, Fiji. Vol. 3. (1930 to date).
6. Agricultural Index (U. S. A.). (1932 to date).
7. Agriculture and Live-Stock in India. Vol. 1. (1931 to date).
8. Allahabad Farmer. Vol. 4. (1930 to date).
9. American Society of Agronomy, Journal of (New York). Vol. 21. (1929 to date).
10. Berichte des Ohara Institut fur landwirtschaftliche. Vol. 5. (1931 to date).
11. Bulletinul Cultivarei si Fermantarei Tutunului. (Bulletin de l'Institute Experimental pour la culture et la fermentation du tabac) (Rumania). Vol. 21. (1932 to date).
12. Bulletin of Central Experimental Rice Station (Russia). Vol. 1. (1934 to date).
13. Crop Reports (National Agricultural Research Bureau, China). Vol. 3. (1935 to date).
14. Cyprus Agricultural Journal. Vol. 25. (1930 to date).

14 (*a*). East African Agricultural Journal. (Nairobi). Vol. 1. (1935—).

15. Empire Journal of Experimental Agriculture (England). Vol. 1. (1933 to date).
16. Experiment Station Records. (U. S. Department of Agriculture). Vol. 62. (1930 to date).

16 (*a*). Farmer. (Natal). Vol. 23. (1935 —.)

17. Farming in South Africa (Pretoria). Vol. 8. (1933 to date).
18. Gardening Review (Madras). (1934 to date).
19. Gardens Bulletin (Straits Settlements). Vol. 8. (1934 to date).
20. Giornale di Risicoltura (Italy). Vol. 20. (1930 to date).
21. Hyderabad Farmer. Vol. 1. (1931 to date).
22. Imperial Institute, Bulletin of the (England). Vol. 10. (1912 to date).
23. Journal of Agricultural Research (U. S. A.). Vol. 41. (1930 to date).
24. Journal of Agricultural Science (England). Vol. 1. (1905 to date).
25. 'Kisan' (Patna). Vol. 1. (1933 to date.).
26. Madras Agricultural Journal. Vol. 19. (1930 to date).
27. Malayan Agricultural Journal. Vol. 18. (1930 to date).

27 (*a*). Malayan Agri.—Horticultural Association Magazine. Vol. 3.(1933 — .)

APPENDIX IX—*contd.*

Agriculture—contd.

28. MINISTRY OF AGRICULTURE, JOURNAL OF THE. (England). Vol. 20. (1913-14 to date).
29. MONTHLY BULLETIN OF AGRICULTURAL ECONOMIC AND SOCIOLOGY (International Institute of Agriculture, Rome). Vol. 1. (1910 to date).
30. MONTHLY BULLETIN OF AGRICULTURAL SCIENCE AND PRACTICE. (International Institute of Agriculture, Rome). Vol. 1. (1910 to date).
31. MONTHLY CROP REPORT AND AGRICULTURAL STATISTICS. (International Institute of Agriculture, Rome). Vol. 1. (1910 to date).
32. NEW ZEALAND JOURNAL OF AGRICULTURE. Vol. 40. (1930 to date).
33. OFFICIAL RECORD. (U. S. Department of Agriculture). Vol. 9. (1931-1933). (Ceased Publication).
34. PHILIPPINE JOURNAL OF AGRICULTURE, MANILA. Vol. 2. (1931 to date).
35. PLANT INDUSTRY IN U. S. S. B. (Russia). 1934.
36. PLANTERS CHRONICLE. (Coonoor, Madras). 1934.
37. PLANTERS JOURNAL AND AGRICULTURIST. (Calcutta). 1935.
38. REVIEW OF AGRICULTURAL OPERATIONS IN INDIA. (1919 to date).
39. RHODESIA AGRICULTURAL JOURNAL. 1934.
40. RUBBER RESEARCH INSTITUTE, MALAYA, JOURNAL OF THE. Vol. 1. (1929 to date).
41. SEASONAL NOTES (Punjab Agricultural Department). Vol. 7. (1930 to date).
42. SOUTH EASTERN AGRICULTURAL COLLEGE, WYE, KENT, JOURNAL OF THE. (1907 to date.)
43. TASMANIAN JOURNAL OF AGRICULTURE. Vol. 1. (1930 to date).
44. TROPICAL AGRICULTURE. (Trinidad). Vol. 7. (1930 to date).
45. TROPICAL AGRICULTURIST. (Ceylon). Vol. 41—58, 73. (1929 to date).
46. TREUBIA (Dutch East Indies). Vol. 1. (1919 to date).
47. WEST INDIA COMMITTEE CIRCULAR. Vol. 47. (1932 to date).

47 (*a*). WHEAT STUDIES. (U. S. A.). Vol. III.

Animals Husbandry and Dairying.

48. ANIMAL BREEDING ABSTRACTS. (Imperial Bureau of Animal Genetics). Vol. 1. (1933 to date).
49. AYRSHIRE CATTLE SOCIETY'S JOURNAL. 1934.
50. BLOOD-STOCK BREEDERS' REVIEW. (England). Vol. 18. (1929 to date).
51. FARMER AND STOCK-BREEDER. (England). 1931 to date.

51 (*a*). GOAT WORLD. (U. S. A.). Vol. 20. (1935— .)

52. HORSE BREEDING. (Delhi). Vol. 9. (1933 to date).
53. HARPER ADAMS UTILITY POULTRY JOURNAL. Vol. 17. (1931-32 to date).
54. INDIAN POULTRY GAZETTE. Vol. 21. (1932 to date).
55. INTERNATIONAL REVIEW TO POULTRY SCIENCE. (Holland). Vol. 4. (1931 to date).
56. JOURNAL OF THE BRITISH GOAT SOCIETY. Vol. 27. (1934 to date).
57. JOURNAL OF THE BRITISH DAIRY FARMER'S ASSOCIATION. Vol. 43. (1931 to date).

APPENDIX IX—*contd.*

Animals Husbandry and Dairying—contd.

58. JOURNAL OF DAIRY RESEARCH. (England). Vol. 1. (1929 to date).

59. JOURNAL OF DAIRY SCIENCE (U. S. A.). Vol. 13. (1930 to date).

60. LIST OF REFERENCES FROM CURRENT LITERATURE. (Issued by the National Institute for Research in Dairying, Near Reading). (1931 to date).

61. NUTRITION ABSTRACT AND REVIEWS. (Imperial Bureau of Animal Nutrition). Vol. 1. (1931 to date).

62. ONDERSTEPOORT JOURNAL. (South Africa, Pretoria). Vol. 1. (1933 to date.)

63. POULTRY AND POULTRY HUSBANDRY. (England). (1931 to date.)

64. POULTRY SCIENCE. (U. S. A.). Vol. 1. (1921-22 to date).

Biology, Heredity and Genetics.

65. BIOLOGICAL ABSTRACTS. (U. S. A.). Vol. 1. (1927 to date).

66. BIOLOGICAL BULLETIN. (U. S. A.). Vol. 60. (1931 to date).

67. BIOLOGICAL REVIEWS. (England). Vol. 7. (1932 to date).

68. GENETICS. (U. S. A.). Vol. 15. (1930 to date).

69. HERBAGE ABSTRACTS. (Imperial Bureau of Plant Genetics). Vol. 1. (1931 to date).

70. JOURNAL OF GENETICS. (England). Vol. 21. (1929 to date).

71. JOURNAL OF HEREDITY (U. S. A.). Vol. 21. (1930 to date).

72. PLANT BREEDING ABSTRACTS (Imperial Bureau of Plant Genetics). Vol. 1. (1930 to date).

73. QUARTERLY REVIEW OF BIOLOGY. (U. S. A.). Vol. 5. (1930 to date).

Botany and Mycology. (See also Genetics).

74. BULLETIN DU JARHIN BOTANIQUE. (Buitenzorg). Vol. 1. (1919 to date).

75. BULLETIN OF APPLIED BOTANY OF GENETICS AND PLANT BREEDING. [Lenin Academy of Agricultural Science in U. S. S. R. Institute of Plant Industry. 13 Series. (1931 to date).

76. BULLETIN OF MISCELLANEOUS INFORMATION. (Kew Gardens). (1888-1889, 1901, 1906-18 and 1931 to date).

77. DER ZUCHTER. (Germany). Vol. 2. (1930 to date).

78. DIE ERNAHRUNG ER PELLANZE. (Germany). Vol. 27. (1931 to date).

79. HORTICULTURAL ABSTRACTS. (Imperial Bureau of Fruit Production). Vol. 1. (1931 to date).

80. INTERNATIONAL BULLETIN OF PLANT PROTECTION. (International Institute of Agriculture, Rome). Vol. 3. (1929 to date).

81. INDIAN BOTANICAL SOCIETY, JOURNAL OF THE. Vol. 1. (1919-20 to date).

82. NATIONAL INSTITUTE OF AGRICULTURAL BOTANY, JOURNAL OF THE. (England). Vol. 1. (1924 to date).

83. REVIEW OF APPLIED MYCOLOGY. (England). Vol. 1. (1922 to date).

84. TROPENPFLANZER. (Germany). (1930 to date.)

APPENDIX IX—*contd.*

Chemistry including Agricultural Chemistry, Biochemistry and Soil Science.

85. ANNUAL REPORT OF THE PROGRESS OF APPLIED CHEMISTRY. Vol. 1. (1916 to date).
86. ANNUAL REVIEW OF BIOCHEMISTRY. Vol. 1. (1932 to date).
87. CHEMICAL SOCIETY, JOURNAL OF THE. (England). 1928 to date.
88. HILGARDIA (U. S. A.). Vol. 3. (1928 to date). (incomplete).
89. IMPERIAL BUREAU OF SOIL SCIENCE. Publications—
    (*i*) Monthly Letters. (1932 to date.)
    (*ii*) Publications relating to soils and fertilizers (1932 to date).
90. INDIAN CHEMICAL SOCIETY, JOURNAL OF THE. Vol. 10. (1933 to date).
91. INDUSTRIAL CHEMIST. (England). (1932 to date.)
92. INTERNATIONAL SOCIETY OF SOIL SCIENCE. PROCEEDINGS OF THE. Vol. 6. (1931 to date).
93. SOIL RESEARCH. (International Society of Soil Science). Vol. 1. (1930 to date).
94. SOIL SCIENCE (U. S. A.). Vol. 1. (1916 to date).

Commerce.

95. BOARD OF TRADE JOURNAL. (England). (1932 to date).
96. BOMBAY CHAMBER OF COMMERCE.—Current Quotations. (1932 to date).
97. CAPITAL. (Calcutta). (1931 to date).
98. COMMERCE. (Calcutta). Vol. 44. (1932 to date).
99. COMMERCE REPORTS. (U. S. A.). (1930 to date).
100. COMMERCIAL GAZETTE. (Calcutta). (1933 to date).
101. COMMERCIAL AMERICA. Vol. 129. (1932 to date).
102. DAILY IMPORT LIST. (Calcutta). (1933 to date).
103. INDIAN MERCHANTS CHAMBER, QUARTERLY JOURNAL. Vol. 25. (1932 to date).
104. INDIAN TRADE JOURNAL. Vols. 1-5, 7-27, 29-47 and 93. (1929 to date).
105. INDO-COMMERCIAL GAZETTE. (Austria). (1934.)
106. MANCHESTER GUARDIAN COMMERCIAL SUPPLEMENT. (1932 to date).
107. MONTHLY SURVEY OF BUSINESS CONDITIONS IN INDIA. Vol. 1. (1933 to date).
108. TIMES ENGINEERING AND COMMERCIAL SUPPLEMENT. (England). (1932 to date).
109. OIL AND COLOUR TRADE JOURNAL. (England). (1933 to date).

Cotton and other Textiles.

110. BORODA ZA KLOPOK (COTTON FIBRE). (Russia). 1933 to date.
111. BULLETIN OF THE CENTRAL ASIA SCIENTIFIC RESEARCH COTTON INSTITUTE. (Russia). (1930 to date).
112. EMPIRE COTTON GROWING REVIEW. (England). Vol. 1. (1924 to date).
113. FINANCIAL NEWS. (Bombay). (Previously called 'Cotton and Finance'). Vol. 7 (1931 to date).
114. ITERNATIONAL COTTON BULLETIN. (Manchester). Vol. 7. (1929 to date).
115. RAW COTTON TRADE STATISTICS. (Department of Commercial Intelligence and Statistics, India). (1931-32 to date).
116. SUMMARY OF CURRENT LITERATURE. (British Cotton Industry Research Association). (England). Vol. 11. (1931 to date).
117. TEXTILE INSTITUTE, JOURNAL OF THE. (Manchester). Vol. 21. (1930 to date).

APPENDIX IX—*contd.*

Economics.

118. BENGAL CO-OPERATIVE JOURNAL. Vol. 18. (1932-33 to date).

119. BOMBAY CO-OPERATIVE QUARTERLY. Vol. 15. (1931 to date).

120. BULLETIN ECONOMIQUE DE L'INDOCHINE. Vol. 34. (1931 to date).

121. B. & O. CO-OPERATIVE JOURNAL. Vol. 9. (1931 to date).

122. ECONOMIC HISTORY. (A supplement of Economic Journal). (England). Vol. 2. (1931 to date).

123. ECONOMIC JOURNAL. (England). Vols. 20-22, 24-26 and 40. (1930 to date).

124. ECONOMIC JOURNAL. (Afghanistan). (1933 to date).

124 (*a*). ECONOMIST. (England). September (1935—).

124 (*b*). GOVERNMENT MEASURES AFFECTING AGRICULTURAL PRICES (International Institute of Agriculture, Rome). Vol. 1. (1935—).

125. INDIAN FINANCE. (1931 to date).

126. INDUSTRIAL AND LABOUR INFORMATION. (Geneva). Vol. 35. (1930 to date).

127. MADRAS JOURNAL OF CO-OPERATION. Vol. 22. (1932 to date).

128. WIRTSCHAFTSDIENST. (Germany). Vol. 20. (1935).

Entomology.

129. ARBEITTEN UBER MORPHOLOGISCHE UND TOXONOMISCHE ENTOMOLOGIE AUS BERLIN-DAHLEM. (Germany). Vol. 1 (1934 to date).

130. ARBEITEN UBER PHYSIOLOGISCHE UND ANGEWANDTE ENTOMOLOGIE AUS BERLIN-DAHLEM. (Germany). Vol. 1. (1934 to date).

131. ENTOMOLOGISCHE BEIHEFTE AUS BERLIN-DAHLEM. (Germany). (1934).

132. BULLETIN OF ENTOMOLOGICAL RESEARCH. (England). Vol. 1. (1910 to date).

133. REVIEW OF APPLIED ENTOMOLOGY: SERIES 'A'. (Agriculture). (England). Vol. 19. (1931 to date).

134. REVIEW OF APPLIED ENTOMOLOGY: SERIES 'B'. (Veterinary). (England). Vol. 19. (1931 to date).

Forestry.

135. INDIAN FORESTER. Vols. 1-14, 37-43 and 57. (1931 to date).

136. INDIAN FOREST RECORDS. Vol. 2. (1910 to date).

General.

137. ASIATIC SOCIETY OF BENGAL, JOURNAL AND PROCEEDINGS OF THE. Vol. 1. (1905 to date).

138. BULLETIN OF THE PAN-AMERICAN UNION. (U. S. A.). Vol. 66. (1932 to date).

139. COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH, JOURNAL OF THE. (Australia). Vol. 1. (1927 to date).

140. INDIAN CONCRETE JOURNAL. Vol. 5. (1931 to date).

141. INDIAN REVIEW. Vol. 30. (1929 to date).

142. INDIAN ROADS. (I. and L. Department). (1931 to date).

143. INTERCINE. (Rome). (Previously called 'International Review of Educational Cinematography'). Vol. 3. (1931 to date).

APPENDIX IX—*contd.*

General—contd.

144. INSTITUTE OF BREWING, JOURNAL OF THE. (England). Vol. 33. (1927 to date).

144 (*a*). JOURNAL OF THE ROYAL SOCIETY OF ARTS. (England). (May 1935 to date).

145. MADRAS UNIVERSITY, JOURNAL OF. VOL. 1. (1928 to date).

145 (*a*). MODERN REVIEW. (Calcutta). August 1935 to date.

146. NEW ZEALAND JOURNAL OF SCIENCE AND TECHNOLOGY. Vol. 10. (1923 to date).

147. ROUND TABLE. (England). (1934 to date).

148. SUMMARY OF CURRENT LITERATURE. (Department of Scientific and Industria Research). (England). Vol. 3. (1930 to date).

League of Nations.

149. LEAGUE OF NATIONS, MONTHLY SUMMARY OF THE. Vols. 1-9- and 11 to date.

150. LEAGUE OF NATIONS, OFFICIAL JOURNAL. *(1920 to date).*

151. MONTHLY BULLETIN OF STATISTICS. *(See under 'Statistics').*

152. QUARTERLY BULLETIN OF INFORMATION ON THE WORK OF INTERNATIONAL ORGANIZATIONS. (Geneva). *Vol. 3. (1931 to date).*

Medicine.

153. BULLETIN OF HYGIENE. (England). Vol. 6. (1931 to date).

153 (*a*). INDIAN JOURNAL OF MEDICAL RESEARCH. (Calcutta). Vol. 19. (1931—).

154. INDIAN MEDICAL GAZETTE. (1935).

154 (*a*). INDIAN MEDICAL RESEARCH MEMOIRS. (Calcutta). No. 22. (1932—).

155. JOURNAL OF COMPARATIVE PATHOLOGY AND THERAPEUTICS. (England). Vol. 44. (1931 to date).

156. JOURNAL OF HYGIENE. (England). Vol. 29. (1929 to date).

157. ROYAL SOCIETY OF TROPICAL MEDICINE AND HYGIENE, TRANSACTIONS OF THE. (England). Vol. 25. (1931 to date).

158. TROPICAL DISEASES BULLETIN. (England). Vol. 28. (1931 to date).

Science—General.

159. CURRENT SCIENCE. (Bangalore). Vol. 2. (1933 to date).

160. BOMBAY NATURAL HISTORY SOCIETY. JOURNAL OF THE. Vol. 18. 11-15, 17-18. 22-28, 33. (1929 to date).

161. NATURE. (England). Vols. 119-120 and 125. (1930 to date).

162. NATURE AND APPLIED SCIENCE BULLETIN. (Philippine University). Vol. 1. (1930 to date).

163. RECORDS OF THE GEOLOGICAL SURVEY OF INDIA. Vol. 62. (1929 to date).

163 (*a*). SCIENCE PROGRESS. (England). Vol. 30. (1935—).

Statistics.

164. ACCOUNTS RELATING TO COASTING TRADE AND NAVIGATION OF BRITISH INDIA. (1933-34 to date). (Monthly).

165. ACCOUNTS RELATING TO THE INLAND (Rail and River-Borne) Trade of India. (1933-34 to date). (Monthly).

APPENDIX IX—*contd.*

Statistics—contd.

166. ACCOUNTS RELATING TO TRADE AND COMMERCE OF CERTAIN FOREIGN COUNTRIES AND BRITISH COUNTRIES OVERSEAS. (England). (1930 to date). (Quarterly).

167. ACCOUNTS OF THE SEA-BORNE TRADE AND NAVIGATION OF BRITISH INDIA. (April 1929 to date). (Monthly).

168. ACCOUNTS RELATING TO TRADE AND NAVIGATIONS OF THE UNITED KINGDOM. (1931 to date). (Monthly).

169. AMERICAN STATISTICAL ASSOCIATION, JOURNAL OF THE. Vol. 28. (1933 to date).

170. BIOMETRIKA. (England). Vol. 25. (1933 to date).

171. BOMBAY BI-WEEKLY COTTON STATISTICS. (East India Cotton Association.) (1933 to date).

172. KARACHI PRICE CURRENT AND MARKET REPORT. (1932 to date).

173. KATHIAWAR TRADE STATISTICS. (1933 to date).

174. MADRAS PRICE CURRENT AND MARKET REPORT. (1932 to date).

175. MONTHLY BULLETIN OF STATISTICS (League of Nations). Vol. 12. (1931 to date).

176. MONTHLY CROP REPORT AND AGRICULTURAL. STATISTICS. (International Institute of Agriculture, Rome). (*See* under 'Agriculture').

177. MONTHLY STATISTICS OF COTTON SPINNING AND WEAVING IN INDIAN MILLS. (1933 to date).

178. MONTHLY STATISTICS OF PRODUCTION OF CERTAIN SELECTED INDUSTRIES OF INDIA. (1932-33 to date).

179. ROYAL STATISTICAL SOCIETY, JOURNAL OF THE. (England). Vol. 92. (1929 to date).

179 (*a*). SANKHYA. (Calcutta). Vol. 1. (1933—).

180. WHOLESALE PRICES OF CERTAIN STAPLE ARTICLES OF TRADE AT SELECTED STATIONS IN INDIA. (1932 to date).

Sugar.

181. FACTS ABOUT SUGAR (U. S. A.). Vol. 26. (1931 to date).

182. INTERNATIONAL SUGAR JOURNAL. (England). Vol. 32. (1930 to date).

Veterinary Science.

183. AMERICAN VETERINARY MEDICAL ASSOCIATION, JOURNAL OF THE. Vol. 29. (1930 to date).

184. ANNALES DE L'INSTITUTE PASTEUR. (France). Vol. 46. (1931 to date).

185. ANNALES DE MEDICINE VETERINAIRE. (France). Vol. 76. (1931 to date).

186. AUSTRALIAN VETERINARY JOURNAL. Vol. 7. (1931 to date).

187. BOLETIM DE AGRICULTURA ZOOTECHNIAE VETERINARIA. (Brazil). Vol. 6. (1933 to date).

188. BULLETIN DE L'INSTITUTE PASTEUR. (France). Vol. 29. (1931 to date).

189. BULLETIN DE L'ACADEMIE VETERINARY DE FRANCE. Vol. 4. (1931 to date).

190. CENTRAL PROVINCES VETERINARY JOURNAL. Vol. 3. (1934 to date).

191. INDEX VETERINARIUS, (Imperial Bureau of Animal Health). Vol. 1. (1933 to date).

APPENDIX IX—*concld.*

Veterinary Science—contd.

192. INDIAN JOURNAL OF VETERINARY SCIENCE AND ANIMAL HUSBANDRY. Vol. 1. (1931 to date).

193. INDIAN VETERINARY JOURNAL. Vol. 7. (1930 to date).

194. JAPANESE SOCIETY OF VETERINARY SCIENCE, JOURNAL OF THE. Vol. 10. (1931 to date).

195. JOURNAL OF THE ROYAL ARMY VETERINARY CORPS. (England). Vol. 2. (1931 to date).

196. OFFICE INTERNATIONAL DES EPIZOOTES—BULLETIN MENSUEL. (France). Vol. 4. (1930 to date).

197. PUNJAB VETERINARY JOURNAL. (1934 to date).

198. RECUEIL DE MEDICINE VETERINAIRE. Vol. 107. (1931 to date).

199. RECUEIL DE MEDICINE VETERINAIRE EXOTIQUE. (France). Vol. 4. (1931 to date).

200. SOUTH AFRICAN VETERINARY MEDICAL ASSOCIATION, JOURNAL OF THE. Vol. 2. (1931 to date).

201. VETERINARY JOURNAL. (England). Vol. 87. (1931 to date).

202. VETERINARY MAGAZINE. (U. P.). Vol. 20. (1931 to date).

203. VETERINARY RECORD. (England). (1931 to date).

204. VETERINARY BULLETIN. (Imperial Bureau of Animal Health). (1932 to date).

205. WIENER TIERARZTLICHE MONATSSCHRIFT. (Germany). Vol. 22. (1935).

Zoology.

206. HELMINTHOLOGICAL ABSTRACTS. (England). (1932 to date.)

207. HELMINTHOLOGICAL SOCIETY OF WASHINGTON, PROCEEDINGS OF THE. Vol. 1. (1934 to date).

208. JOURNAL OF HELMINTHOLOGY. (England). Vol. 9. (1931 to date).

209. JOURNAL OF PARASITOLOGY. (U. S. A.). Vol. 17. (1930 to date).

APPENDIX X.

Annual Accounts for the year 1935-36 relating to the grant for research purposes.

RECEIPTS.								PAYMENTS.						
Head of account.	Receipts during the year.			Remarks.	Grants. Original.	Grants. Net.	Payments. Head of Account.	Expenditure during the year.			Excess — or saving + over net grant.			Remarks.
	Rs.	a.	p.		Rs.	Rs.		Rs.	a.	p.	Rs.	a.	p.	
1. Opening balance on 1st April 1935	4,84,689	14	4		3,000	2,350	1. Sugar Committee	2,230	14	0	+119	2	0	Inconsiderable.
2. (*i*) Annual recurring grant from the Government of India for research work.	5,00,000	0	0		51,000	54,000	2. Sugar Technologist— (*a*) Main Office	53,934	8	3	+65	7	9	,,
					8,900	8,100	(*b*) Sugar Cable Service	8,072	12	5	+27	3	7	,,
(*ii*) Grant from Government of India for research work connected with the promotion of Sugar Industry.	2,50,000	0	0		6,500	4,100	(*c*) Indian Sugar Trade Information Service.	4,020	1	2	+79	14	10	,,
							(*d*) Establishment of Research and testing station for the indigenous system of gur and sugar manufacture by the Sugar Technologist to the Council for 5 years at Bilari.	13,611	1	1	—11	1	1	,,
(*iii*) Grant of Marketing Scheme (Provincial Portion).	2,00,000	0	0		69,100	13,600								
3. Donations from Indian States— Rs.														
(*i*) Baroda 5,000														
(*ii*) Cochin 5,000						6,200	(*e*) Bureau of Sugar Standards ..	6,146	9	6	+53	6	6	,,
(*iii*) Travancore 5,000					16,400	15,800	3. Appointment of the Chief Economist and Staff in connection with the investigations into the cost of production of crops in the principal sugarcane and cotton tracts in India.	15,764	10	6	+35	5	6	,,
(*iv*) Bhopal 2,500														
(*v*) Mysore 10,000	27,500	0	0											
4. Interest from investments, etc.—														
(*a*) Interest from 5% loan of 1939-44	77,525	9	7		20,000	20,000	4. Grant to the Harcourt Butler Technological Institute.	20,000	0	0	..			,,
(*b*) Interest from fixed deposits ..	15,290	13	10											
(*c*) Interest from motor car advance	91	0	0				5. Investigation into the cost of production of crops in the principal sugarcane and cotton tracts in India—							
5. Receipts from Sugar Cables Service	4,213	15	4											
							(*i*)—							
					15,000	15,000	(*a*) Madras	14,940	0	0	+60	0	0	,,
					18,100	19,850	(*b*) Bombay	19,850	0	0	..			,,
					17,600	33,100	(*c*) Punjab	33,100	0	0	..			,,
					10,400	9,700	(*d*) Bihar and Orissa	9,696	0	0	+ 4	0	0	,,
					7,700	7,700	(*e*) Bengal	7,620	0	0	+80	0	0	,,
6. Receipts on account of fees for professional advice given by the Sugar Technologist to the Council to Sugar factories.	5,243	5	0		15,000	14,700	(*f*) United Provinces	14,680	0	0	+20	0	0	,,
					15,200	14,000	(*g*) Central Provinces and Berar	14,000	0	0	..			,,
7. Receipts from Sugar Trade Information Service.	2,160	0	0		4,700	4,150	(*h*) Hyderabad	4,150	0	0	..			,,
					4,700	4,700	(*i*) Mysore	4,700	0	0	..			,,
8. Receipts from the Empire Marketing Board in respect of Moiety of expenditure payable for the Bengal and Burma rice schemes.	33,624	14	9		4,700	4,250	(*j*) Baroda	4,250	0	0	..			,,
					4,600	4,600	(*k*) Sind	4,600	0	0	..			,,

		9. Receipts from the Indian Central Cotton Committee in respect of moiety of expenditure payable for the "Scheme of Investigation into the Cost of Production of Crops in the Principal Sugarcane and Cotton tracts in India.	72,640	12	6				
		10. Receipts realised from various Schemes financed by the Council.	25,304	4	8				
		11. Receipts on account of unspent balances of grants given by the Council in previous year.	4,707	15	11				
		12. Receipts on account of admission to the Harcourt Butler Technological Institute.	794	4	0				
		13. Receipts of the Bureau of Sugar Standards.	3,291	2	0				
		14. Gain on account of exchange fluctuations on Empire Marketing Boards' contributions to the cost of the Burma and Bengal rice research Schemes.	325	5	3				
		15. Other Miscellaneous receipts ..	1,091	7	11				
		16. Repayment of motor car advance by the Statistician.	420	0	0				
		17. Deposit on account of moiety of expenditure paid by the Indian Central Cotton Committee for the "Scheme of Investigation into the cost of Production of crops in the principal Sugarcane and Cotton Tracts in India.	..						
		18. Deposit for loan of books from the Sugar Technologist to the Council.	35	0	0				
		19. Repayment of advances of pay, by the research establishment at Headquarters.	2,070	0	0				
		20. Amount credited under "Suspense" pending final adjustment.	500	0	0				
		21. Security deposits received from contractors for Research and Testing Station buildings.	1,551	0	0				
		22. Recoveries on account of General Provident Fund and Income-Tax.	5,312	8	0				
		Total Receipts ..	17,18,383	5	1				
		Receipts of investments and re-investments from fixed deposits and treasury bills.	13,00,000	0	0				
		Carried over ..	30,18,383	5	1				
4,800	4,150	(ii) Cost on account of remuneration for checking the data.	4,145	0	0	+5	0	0	,,
6,500	50	(iii) Cost of meetings	15	0	0	+35	0	0	,,
19,400	13,900	6. Grant for research on Mosaic and other cane diseases at Pusa.	13,884	0	0	+16	0	0	,,
25,600	20,300	7. Establishment of Sugarcane station in Bihar and Orissa and appointment of a Sugarcane Specialist.	20,231	0	0	+69	0	0	,,
10,000	8,650	8. Establishment of a Sub-station of the Coimbatore Imperial Sugar Station at Karnal.	8,626	0	0	+24	0	0	,,
3,700	3,700	9. Grant to Government of Mysore for breeding of thick canes in Mysore.	3,660	0	0	+40	0	0	,,
2,100	2,100	10. Lump sum grants of Rs. 8,000 each to the United Provinces, Bihar and Orissa and Punjab Governments for experiments in the design of a satisfactory small power sugarcane crushing mill.	2,095	0	0	+5	0	0	,,
2,300	2,100	11. Sugarcane seedling testing station at Dacca.	2,023	12	3	+76	3	9	,,
63,200	63,200	12. Sugarcane research Station in the Bombay, Deccan.	63,135	8	3	+64	7	9	,,
5,900	7,760	13. Research on the Genetics of sugarcane at the Imperial Cane Breeding Station, Coimbatore.	7,760	9	0	—0	9	0	,,
34,100	41,870	14. Research on sugarcane in the Madras Presidency.	41,864	8	6	+1	7	6	,,
31,100	26,170	15. Scheme for the establishment of a sugarcane research station for the Punjab.	26,171	1	3	—1	1	3	,,
16,000	19,200	16. Investigations into various problems of sugar industry in the United Provinces.	19,200	0	0	..			,,
8,300	9,500	17. Extension of Sugarcane work at the Jorhat Experimental station, Assam.	9,500	0	0	..			,,

RECEIPTS.

Head of account.	Receipts during the year. Rs. a. p.	Remarks.	Grants. Original. Rs.	Grants. Not. Rs.	Payments.	Expenditure during the year. Rs. a. p.	Excess — or saving + over not grant. Rs. a. p.	Remarks.
Brought forward ..	30,18,383 5 1				Brought forward ..			
			1,600	1,400	18. Grant to the Government of Bihar and Orissa for investigations into the possibilities of manufacturing Khandsari Sugar by the Single pan method.	1,406 0 0	—6 0 0	Inconsiderable
			86,300	85,000	19. Special Staff for Locust research work with headquarters at Karachi.	85,515 1 0	—515 1 0	,,
			1,000	..	20. Locust Committee	..	..	,,
			1,500	1,000	21. Central Locust Bureau	978 4 0	+21 12 0	,,
			1,000	..	22. Fertilizers Committee	1 7 0	+1 7 0	,,
			16,000	17,400	23. Statistical Section of the Bureau of Agricultural Intelligence.	17,383 3 0	+16 13 0	,,
			2,500	1,000	24. Indian Oil Seed Crushing Industry Committee.	976 0 0	+24 0 0	,,
			1,000	..	25. Award of prize for a bone-crusher worked (*a*) by animal power (*b*) by mechanical power.	..	..	,,
			..	700	26. Marketing Scheme at Headquarters	675 7 0	+24 9 0	,,
			2,33,000	1,94,500	27. Marketing Scheme (Provincial portion).	1,94,496 0 0	+4 0 0	,,
			12,400	22,900	28. Botanical Sub-station at Karnal ..	22,875 14 4	+24 1 8	,,
			9,300	21,320	29. Agricultural Meteorology, Poona ..	21,320 0 0	..	,,
			400	6,460	30. Grant to the Government of Punjab for locust control measures.	6,455 0 0	+5 0 0	,,
			4,300	3,870	31. Appointment of a Physical Assistant on the Staff of the Agricultural Chemist, Bengal.	3,870 0 0	..	,,
			..	..	33. Consignment of mangoes to Empire Marketing Board.	2 3 0	—2 3 0	,,
			44,100	46,705	33. Grant to Principal, Agra College, Agra, for investigation of Rusts of Wheat and Barley.	46,750 0 0	..	,,
			26,200	26,100	34. Co-ordinated Scheme of rice research—			
			17,200	16,600	(*i*) Burma	26,100 0 0	..	,,
			36,600	56,600	(*ii*) Central Provinces	16,600 0 0	..	,,
			24,700	10,000	(*iii*) Bihar and Orissa	56,628 0 0	—28 0 0	,,
			24,300	22,100	(*iv*) Assam	10,000 0 0	..	,,
			24,700	18,250	(*v*) Bengal	22,108 0 0	—8 0 0	,,
					(*vi*) United Provinces	18,250 0 0	..	,,
Carried over ..	30,18,383 5 1							

PAYMENTS.

Brought forward.. 30,18,383 5 1

19,500	19,250	(vii) Madras	19,250 10 3	—0 10 3	"
4,000	4,000	35. Research work on potatoes in Madras	4,000 0 0	..	"
7,500	8,000	36. Grant to Pusa Institute for Potato breeding research in Northern India.	7,997 6 0	+2 10 0	"
		37. Provincial scheme for Fruit Research—			
17,000	18,100	(a) Bombay	18,100 0 0	..	"
21,200	11,920	(b) Madras	11,915 0 0	+5 0 0	"
7,600	7,500	(c) Bengal	7,500 0 0	..	"
25,500	26,550	(d) United Provinces	26,550 0 0	..	"
15,000	14,400	(e) Bihar and Orissa	14,414 0 0	—14 0 0	"
5,200	5,500	(f) Punjab	5,452 0 0	+48 0 0	"
34,100	30,300	38. Dry farming research scheme for the Bombay Deccan.	30,285 0 0	+15 0 0	"
24,000	44,100	39. Dry farming research scheme in the ceded Districts of Madras.	44,100 0 0	..	"
..	21,700	40. Dry farming research scheme for the South East Punjab.	21,670 0 0	+30 0 0	"
10,100	10,100	41. Dry farming research scheme for Hyderabad, Deccan.	10,100 0 0	..	"
10,600	..	42. H. E. H. the Nizam's Government Scheme for the improvement of the castor crop in India.	..	..	"
30,000	30,000	43. Financial Assistance to the Oil Technological Section of the Harcourt Butler Technological Institute.	30,000 0 0	..	"
		44. Malting and Browing Test of Improved Barleys—			
1,600	230	(i) United Provinces	232 7 6	+2 7 6	
500	500	(ii) Punjab	500 0 0	..	"
2,400	2,400	(iii) Bihar and Orissa	2,400 0 0	..	"
..	2,700	45. Chemistry of Malting Cholam, Madras Scheme.	2,700 0 0	..	"
..	10,900	46. Research in systematic cultivation of medicinal plants and study of food poisons by Colonel Chopra.	10,880 0 0	+20 0 0	"
..	12,500	47. Grants for tobacco Co-operative experiments.	12,500 0 0	..	"
6,700	..	48. Investigation of Indian fish poisons and other forest products for their insecticidal properties in Mysore (2 years from 1934-35).	..	..	"
1,400	7,500	49. Dacca University scheme of Agricultural Research.	7,460 0 0	+40 0 0	"
1,000	3,500	50. Professor Mukherjee's scheme of research into properties of colloid soil constitutents.	3,516 11 0	—16 11 0	"

Carried over .. 30,18,383 5 1

Carried over .. ..

RECEIPTS. Head of account.	Receipts during the year. Rs. a. p.	Remarks.	Grants, Original. Rs.	Grants, Not. Rs.	Payments. Head of account.	Expenditure during the year. Rs. a. p.	Excess — or saving + over not grant. Rs. a. p.	PAYMENTS. Remarks.
Brought forward ..	30,18,383 5 1				Brought forward ..	..		
			7,100	7,300	51. Professor Mahalanobis's scheme of investigation on experimental errors in field trials.	7,309 0 0	—9 0 0	Inconsiderable.
			600	950	52. Professor Dastur's scheme of rice physiology.	930 3 11	+19 12 1	„
			1,800	..	53. Investigation on the Organic Constituents of Indian Soils by Professor J. C. Ghosh.	..	..	„
			2,600	2,220	54. Extension of work on "quality" in Crops by the Indian Institute of Science.	2,213 15 3	+6 0 0	„
			1,800	1,300	55. Professor J. B. Seth's scheme for investigating an electric method of Hygrometery, Punjab.	1,284 0 0	+16 0 0	„
			2,600	380	56. Investigation for preparation of cheap synthetic manure from town refuse and waste materials by the Indian Institute of Science, Bangalore.	378 13 0	+1 3 0	„
			10,300	18,350	57. Appointment of a physiological chemist to study animal nutrition problems at Dacca.	18,344 0 0	+6 0 0	„
			5,000	5,000	58. Dr. Slater's Scheme of great breeding.	5,000 0 0	..	„
					59. Appointment of Veterinary Investigation Officers in Provinces (5 years)			
			10,400	10,400	(*i*) Hyderabad	10,350 0 0	+50 0 0	„
			10,300	9,000	(*ii*) Bombay	9,000 0 0	..	„
			9,200	12,650	(*iii*) Bengal	12,649 0 0	+1 0 0	„
			9,400	9,000	(*iv*) Punjab	9,000 0 0	..	„
			9,800	9,300	(*iv*) Bihar and Orissa	9,300 0 0	..	„
			9,100	8,800	(*vi*) Central Provinces	8,750 0 0	+50 0 0	„
			7,200	15,750	(*vii*) Madras	15,740 0 0	+10 0 0	„
			8,700	15,800	(*viii*) United Provinces	15,800 0 0	..	„
			8,500	7,200	(*ix*) Assam	7,200 0 0	..	„
			..	5,400	(*x*) North West Frontier Province ..	5,400 0 0	..	„
			6,600	5,400	60. Punjab Government scheme regarding investigation into the most suitable and economic methods of combating different types of parasitic infection in ruminants in the field.	5,400 0 0	..	„
Carried over ..	30,18,383 5 1				Carried over ..			

Brought forward ..	30,18,383 5 1					
8,400	7,300	61. Extension of work on animal nutrition in the Madras Presidency.	7,300 0 0	..		„
3,000	..	62. Investigation of Jhone's Disease among cattle in Mysore.	..	..		„
200	..	63. Dairy Legislation	..	..		
4,000	5,240	64. All-India Animal Husbandry Bureau	5,236 7 6	+3 8 6		„
14,200	11,100	65. Grant to the Central Provinces Government of Rs. 42,700 for investigation for vaccination of cattle against rinderpest.	11,100 0 0	..		„
..	140	66. Grant to Mr. Verma, Supervisor, Imperial Institute of Animal Husbandry and Dairying, Bangalore, for a special study of Dairy Technology in England.	135 3 0	+4 13 0		„
4,16,000	..	67. Grant for Dairy Research Institute	..	..		„
..	100	68. Award of medals for improvements in Agriculture and Animal Husbandry.	100 0 0	..		„
2,000	580	69. Deputation of Locust Research Entomologist to the Third International Locusts Conference, London.	575 9 0	+4 7 0		„
..	2,640	70. Participation of India in the 3rd International Soil Science Congress, 1935.	2,635 12 0	+4 4 0		„
..	200	71. Participation of India in the Imperial Mycological Conference.	188 8 0	+11 8 0		„
..	1,600	72. Participation of India on the 5th triennial conference of International Society of Sugarcane Technologists.	1,604 7 0	—4 7 0		„
..	650	73. Participation of India at the Imperial Botanical Conference and International Botanical Congress.	625 0 0	+24 8 0		„
..	50	74. Participation in the 10th World Dairy Congress.	19 9 0	+30 7 0		„
1,200	..	75. Contributions to International Office of Epizootics, Paris.				
8,000	8,000	76. Imperial Mycological Institute, London.	8,000 0 0	..		„
13,000	14,000	77. International Institute of Agriculture, Rome.	13,962 13 0	+37 3 0		„
29,200	29,200	78. Imperial Agricultural Bureau, London.	29,166 10 0	+33 6 0		„
1,300	..	79. Imperial Institute of Entomology ..	..	..		
100	..	80. Contributions to the Tobacco Federation of the British Empire.	..	..		
Carried over ..	30,18,383 5 1		Carried over ..			

RECEIPTS.

Head of account.	Receipts during the year.	Remarks.	Grants. Original.	Grants. Not.	Payments. Head of account.	Expenditure during the year.	Excess — or saving + over not grant.	PAYMENTS. Remarks.
	Rs. a. p.		Rs.	Rs.		Rs. a. p.	Rs. a. p.	
Brought forward ..	30,18,383 5 1				Brought forward ..	..		
			9,300	9,300	81. Contribution towards maintenance of the laboratory for collecting, lending and despatching beneficial parasites at Farnham House and investigation into the control of insects and moulds injurious to stored products at Slough.	9,333 5 0	—33 5 0	Inconsiderable.
			..	150	82. Contribution to the Coffee Section of the British Empire Organisation.	140 0 0	+10 0 0	,,
			..	500	83. Contribution to the Indian Academy of Sciences, Bangalore .	500 0 0	..	,,
			..	500	84. Contributions to the National Institute of Sciences, Calcutta.	500 0 0	..	,,
			2,500	340	85. Sub-section of the Imperial Agricultural Bureaux.	313 14 0	+26 2 0	,,
			7,000	6,700	86. Books and Publications	6,681 4 11	+18 11 1	,,
			9,000	9,000	87. Travelling allowance on non-official members of the Council.	8,907 15 0	+92 1 0	,,
			9,900	8,750	88. Accounts and Audit	8,745 9 6	+4 6 6	,,
			6,000	6,160	89. Travelling allowance of visitors ..	6,158 7 0	+1 9 0	,,
			300	550	90. Editorial Committee	536 2 0	+13 14 0	,,
			500	1,750	91. Miscellaneous	1,741 5 3	+8 10 9	,,
			400	600	92. Staff for work in connection with the several committees appointed by the Imperial Council of Agricultural Research.	623 3 0	—23 3 0	,,
			..	50	93. Surcharge on Income Tax of research staff.	41 6 6	+8 9 6	,,
			..	2,450	94. Selection of candidates for Harcourt Butler Technological Institute.	2,412 5 6	+37 10 6	,,
			..	3,150	95. Deposits and advances repayable ..	3,148 6 0	+1 10 0	,,
			..	5,600	96. Remittances of income-tax Provident funds, etc.	5,551 8 0	+48 8 0	,,
					Total expenditure ..	16,01,629 15 7		
					Investments and re-investments in fixed deposit.	14,08,625 0 0		
					By balance	8,128 5 6		
GRAND TOTAL ..	30,18,383 5 1				GRAND TOTAL ..	30,18,383 5 1		

APPENDIX X—*concld.*

	Amount. Rs.
II. Particulars of Advances outstanding at the end of the year.	
Particulars.	
1. Permanent advance with the Locust Research Entomologist, Karachi	1,500
2. Permanent advance with the Sugar Technologist, Cawnpore	750
3. Permanent advance with the Secretary, Imperial Council of Agricultural Research ..	250
4. Permanent advance with the Librarian, Imperial Council of Agricultural Research ..	10
Total ..	2,510

III. Particulars of Securities, etc.—	Face value. Rs.	Purchase value. Rs.	(Approximate market value Rs. 16,82,638 @ Rs. 108-4-0 for Rs. 100).
1. 5 per cent. loan of 1939-44 (G. P. notes kept by the Controller of Currency)	15,54,400	14,99,995	
2. Four receipts for 2 per cent. fixed desposit Nos. 3325 to 3328, dated 2nd April 1935 for Rs. 50,000 each	2,00,000	2,00,000	
3. Ten receipts for 2 per cent. fixed deposit Nos. 3333 to 3339 and 3341 to 3343, dated 5th April 1936 for Rs. 50,000 each.	5,00,000	5,00,000	
4. Ten five year post office cash certificates, dated 25th September 1935 of the face value of Rs. 1,000 each	10,000	8,625	
5. Five receipts for 2 per cent. fixed deposit Nos. 3554, to 3558, dated 25th January 1936 for Rs. 50,000 each	2,50,000	2,50,000	
IV. Particulars of closing balance—			
1. Cash in hand with the Secretry of the Council ..	*Nil.*		
2. Cash in current account with the Imperial Bank of India, Simla.	8,128 5 6		

N. C. MEHTA,

Secretary,

Imperial Council of Agricultural Research.

The Accounts have been examined according to the best of my information, as a result of a test audit of the books of the Imperial Council of Agricultural Research and consideration of the explanations given, the accounts are correct subject to the remarks made in my Report of even date.

NEW DELHI;

Dated the 21st May 1936.

R. C. KHANNA,

Examiner,

Outside Audit Department.

APPENDIX XI.

List of Scientific and Technical Officers paid from the research grant of the Imperial Council of Agricultural Research as on 31st March 1936.

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
Sugar Technology, Imperial Council of Agricultural Research, Cownpore.					
1. Office of Sugar Technologist.	Sugar Technologist ..	Mr. R. C. Srivastava, M.Sc. (Allahabad) B.Sc. (Tech.) Manchester.	4th July 1930 ..	On deputation from the United Provinces Government.	
	Temporary Technical Assistant.	Mr. S. N. Gundu Rao, B.Sc. Assoc. H. B. T. I.	20th October 1934	By Selection.	
2. Sugar Research and Testing Station (Bilari).	Sugar Research Chemist	Mr. H. L. Bhagat, M.Sc. (Punjab) M. S. (La.).	23rd April 1935 ..	Through the Public Service Commission (India).	
	Engineer	Mr. J. P. Mukerjee B.Sc. (Electrical and Mechanical Engineering), Benares Hindu University.	23rd December 1933.	Through the Public Service Commission (India).	
3. Bureau of Sugar Standards.	Temporary Assistant Chemist.	Mr. N. C. Verma, B.Sc. Assoc. H. B. T. I.	11th March 1935	By selection.	
Locust Research Scheme I. C. A. R.	Locust Research Entomologist to the Imperial Council of Agricultural Research, Karachi.	Rao Bahadur Y. Ramchandra Rao, M.A., F.R.E.S.	13th December 1930.	On foreign service, lent by the Madras Agriculture Department.	
	Assistant Entomologist, Pasni.	Dr. M. L. Roonwal, Ph.D.	6th November 1935.	Direct appointment.	
	Assistant Entomologist, Karachi.	Dr. S. Mukerji, D. Sc.	10th January 1936.	Direct appointment.	
	Locust Research Assistant, Barmar.	Mr. Des Raj Bhatia, M.Sc.	2nd January 1931.	Through the Public Service Commission (India).	

	Locust Research Assistant, Pasni.	Mr. S. M. Taqi Ahsan, M.Sc.	28th March 1934	Direct appointment.
	Locust Research Assistant, Ambagh.	Mr. R. N. Batra M.Sc. ..	27th May 1935 ..	Direct appointment.
	Locust Research Assistant, Pasni.	Mr. Rahmatullah Butt, M.Sc.	12th December 1935.	Direct appointment.
	Biometrical Assistant, Karachi.	Mr. Rashid Ahmad, B.Sc. (Hons.).	23rd August 1935.	Direct appointment.
Statistical—Field Experiment.	Statistician ..	Rao Bahadur M. Vaidyanathan, M.A. L.T.	6th July 1930 ..	Through the Public Service Commission (India).
	Statistical Assistant ..	Mr. S. Subramania Iyer, M.A.	5th June 1933 ..	Through the Public Service Commission (India).
	Agricultural Assistant ..	Mr. T. Krishna Murthy, B.Sc. (Ag.).	11th February 1935.	Through the Public Service Commission (India).
Cost of Production ..	Chief Economist ..	Dr. R. D. Kapur. M.A., B.Sc., Ph.D.	18th July. 1932 ..	Through the Public Service Commission (India).
Imperial Institute of Agricultural Research, Pusa.				
1. Botanical Sub-Station Karnal.	1. Superintendent ..	Mr. Kashi Ram (Offg.) ..	12th April 1934..	By promotion from the Department.
	2. Assistant	Mr. R. B. Ekbote, L.Ag. ..	20th February 1933.	Through the Public Service Commission (India).
2. Sugarcane Sub-Station, Karnal.	1. Assistant	Mr. G. V. James ..	16th April. 1931..	By promotion from the Department.
3. Scheme for research into Mosaic and other diseases of sugarcane, Pusa.	1. Plant Pathologist ..	Dr. B. L. Chona ..	23rd March 1936	Through the Public Ser-Service Commission (India).
	2. Assistant Mycologist	Mr. L. S. Subramanium ..	23rd June 1933	Through the Public Service Commission (India).
	3. Research Assistant ..	Mr. S. A. Rafay, M.Sc. ..	17th October 1932.	Through the Public Service Commission (India).

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
Imperial Institute of Agricultural Research, Pusa—contd.					
4. Scheme for research on Genetics of Sugarcane at the Imperial Cane Breeding Station, Coimbatore.	1. Geneticist	Miss E. K. Janaki Ammal M.A. M.Sc. D.Sc.	26th May 1934 ..	Through the Public Service Commission (India)-	
5. Scheme for Potato breeding in Northern India.	Assistant	Mr. Push Karnath ..	1st April 1935 ..	By selection from post-graduate students at Pusa.	
MADRAS.					
Agricultural Schemes.					
Rice Research Station, Ganjam.	Superintendent, Rice Research Station, Berhampore.	Mr. Samuel Jobitha Raj, B.A. (Zoology and Botany).	27th March 1932	Promoted from the Madras Agricultural Subordinate Service Class I—Upper Subordinate.	
	Assistant ..	Mr. M. B. Venkatanarasinga Rao, B.A. (Mathematics and Physics). B.Sc. Ag., underwent post-gradiuate course in plant genetics at Pusa.	11th April 1932..	Transferred from the Department.	
	Assistant	Mr. K. B. Viswanathan B.Sc., Ag.	1st May 1932 ..	Transferred from the Department.	
	Assistant	Mr. P. Somayajulu B.Sc. Ag.	15th December 1933.	Recruited through the Madras Service Commission.	

2. Investigation into the quality of rice.	Assistant	Mr. C. Rajasekara Mudaliar, M.A.	October 1935 ..	Transferred from the Department.
2A. Research on Potatoes in the Madras Presidency.	Superintendent, Potato Research Station, Nanjanad.	Mr. V. K. Subramanya Mudaliyar, L.Ag.	13th June 1933	Promoted from the Madras Agricultural Subordinate Service Class I—Upper Subordinates.
3. (*a*) Sugarcane Research, Anakapalli.	Farm Manager, Agricultural Research Station.	Mr. I. Sambasiva Rao, B.Sc. Ag.	19th June 1935	Transferred from the Department.
	Botany Assistant ..	Mr. K. Rangaswamy Ayyangar, B.Sc. Ag.	24th April 1935..	Transferred from the Department.
(*b*) Sugarcane Research, Gudiyattam.	Farm Manager ..	Mr. R. Vasudeva Rao ..	29th April 1933	Transferred from the Department.
	Botany Assistant ..	Mr. S. Ramaswami Ayyar, B.Sc. Ag.	11th May 1933	Transferred from the Department.
	Farm Manager ..	Mr. C. Ekambaram, B.Sc. Ag.	16th June 1935	Transferred from the Department.
4. Dry Farming Scheme, Hagari (Madras Presidency).	Superintendent, Agricultural Research Station, Hagari.	Mr. C. Vijayaraghava Acharya, L. Ag.	14th April 1934.	Transferred from the Department.
	Soil Physicist ..	Dr. A. Subba Rao, M.A., Ph.D.	10th March 1936.	Transferred from the Department.
	Assistant in plant Physiology.	Mr. V. Panduranga Rao M.A.	1st October 1935	Transferred from the Department.
	Assistants for Millets ..	Mr. P. Seshadri, B.Sc. Ag.	7th May 1934.	
		Mr. B. L. Narasinha Murthy B.Sc. Ag.	,7th May 1934.	
	Assistant to Soil Physicist.	Mr. S. V. Kuppuswamy Ayyangar.	10th March 1936.	
	Assistant to Soil Physicist.	Mr. A. Abdul Samad (Physics and Chemistry), B.Sc. Ag.	7th May 1934 ..	Transferred from the Department.

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
Agricultural Schemes—contd.					
5. Fruit Research Station, Anantarajupet.	Superintendent ..	Mr. K. C. Naik, B.Ag. (Bombay), M.Sc. (Bristol).	3rd August 1935	Through the Public Service Commission.	
	Farm Manager, Fruit Research Station.	Mr. S. Madhava Rao, B.A. (Physical Science), B.Sc. (Poona), Horiticulture (Advanced).	1st March 1935	Transferred from the Department.	
6. Economic Enquiry into the cost of production of crops in the principal sugarcane and cotton tracts in the Madras Presidency.	District Agricultural Supervisor, Coimbatore.	Mr. M. Subramanya Pillai, L.Ag.	1st April 1933 ..	Transferred from the Department.	
	District Agricultural Supervisor, Bellary.	Mr. V. N. Subbanna Acharya, L.Ag.	5th October 1934	Transferred from the Department.	
	District Agricultural Supervisor, Anakapalle.	Mr. V. Achyutaramayya, L.Ag.	13th November 1934.	Transferred from the Department.	
7. Marketing Scheme	Assistant Marketing Officer.	Mr. S. N. Venkatarama Ayyar, B.A. (Physics and Chemistry, B.Sc. Ag., underwent Statistical training at Calcutta.	21st February 1935.	Pomoted from the Department.	
	Assistant Marketing Officer.	Mr. M. P. Kunhikutti, L.Ag. Underwent post-graduate course in Animal Husbandry and Dairying.	23rd February 1935.	Promoted from the Department.	

Animal Husbandry Scheme.	Assistant Marketing Officer.	Mr. K. W. Chakrapani Marar.	25th February 1935.	Promoted from the Department.	
8. Veterinary Diseases Investigation Scheme.	Veterinary Investigation Officer, Madras.	Mr. G. R. Viswanathan, G.M.V.C., post-graduate training in the United Kingdom and post-graduate course at Muktesar.	13th April 1933 ..	Promoted from the Department.	
9. Animal Nutrition Scheme.	Assistant	Mr. C. Balasubramaniyan, B.A., B.Sc. Ag.	15th September 1935.	Promoted from the Department.	
		Mr. V. N. Marayanayya, B.A., B.Sc., Ag.	Do.	Do.	
		Mr. K. M. Krishna Menon, B.Sc. Ag.	Do.	Do.	
		Mr. S. Varadarajan, B.Sc. Ag.	Do.	Do.	
10. Cholam Malting Scheme.	Assistant Agricultural Chemist.	Mr. M. Suryanarayana, B.Sc. (Cal.).	5th June 1935.	Do.	
BOMBAY.					
1. Investigation of diseases in livestock and their treatment.	Veterinary Investigation Officer, Bombay Presidency.	Mr. R. N. Naik, G.B.V.C...	27th June 1932 ..	Recruited through the Public Service Comsion (India).	
2. Rice Physiology ..	Rice Research Assistant	Mr. B. L. Desai, M.Sc. ..	1st June 1932 ..	Appointed by the Educational Department, Bombay.	In accordance with the scheme the appointment terminated on 31st May 1935. Mr. B. L. Desai was, however, reappointed from 15th June 1935 to 14th July 1935.
3. Sugarcane Research Scheme for the Deccan, Padegaon.	Principal Agricultural Officer.	Rao Saheb B. P. Vagholkar, L.Ag. (Bom.).	6th June 1932 ..	Deputed from the Bombay Agricultural Department.	
	Crop Physiologist ..	Dr. R. D. Rege, M.Sc., (Bom.), Ph. D. (Lond.).	6th July 1932 ..	Recruited through the Board of Selection appointed by the Government of Bombay.	

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
BOMBAY—*contd.*					
	Soil Physiologist ..	Dr. J. K. Basu, M.Sc. (Cal.) Ph. D. (Lond.).	18th June 1932 ..	Recruited through the Board of Selection appointed by the Government of Bombay.	
	District Supervisor ..	Mr. S. T. Purandare, B. Ag. (Bom.).	3rd April 1933 ..	Recruited by the Director of Agriculture, Bombay Presidency.	
	District Supervisor ..	Mr. S. F. Chandrannavar, B. Ag. (Bom.).	3rd April 1933 ..	Recruited by the Director of Agriculture, Bombay Presidency.	
	District Supervisor ..	Mr. P. R. Patil, B. Ag. (Bom.).	3rd April 1933 ..	Recruited by the Director of Agriculture, Bombay Presidency.	
	District Supervisor ..	Mr. D. A. Patel, B. Ag. (Bom.).	3rd April 1933 ..	Recruited by the Director of Agriculture, Bombay Presidency.	
4. Dry Farming Research Scheme.	Chief Investigator, Dry Farming Research Scheme, Sholapur.	Mr. N. V. Kanitkar, M. Ag. B.Sc.	1st October 1933	Deputed from the Bombay Agricultural Department.	
Main-centre, Sholapur.	Assistant Investigator, Dry Farming Research Scheme in charge of Soil Section.	Dr. J. A. Daji, M. Ag., B.Sc.	1st October 1933	Deputed from the Bombay Agricultural Department.	
	Agricultural Overseer ..	Mr. V. N. Apte, B. Ag. (Bom.).	18th December 1931.	Deputed from the Bombay Agricultural Department.	

	Agricultural Overseer ..	Mr. N. B. Patwardhan, B. Ag. (Bom.).	1st March 1932 ..	Deputed from the Bombay Agricultural Department.
	Agricultural Overseer ..	Mr. P. S. Kulkarni, B. Ag. (Bom.).	15th October 1932.	Deputed from the Bombay Agricultural Department.
	Agricultural Overseer ..	Mr. P. B. Wagle, M. Ag. (Bom.)	1st March 1932 ..	Deputed from the Bombay Agricultural Department.
	Agricultural Overseer ..	Mr. S. K. Sannabhadti, B. Ag. (Bom.)	1st September 1935.	Deputed from the Bombay Agricultural Department.
	Agricultural Overseer ..	Mr. S. S. Sirur, B. Ag. (Bom.).	5th August 1932	Transferred from the scheme financed from the funds of the Indian Central Cotton Committee.
	Agricultural Overseer ..	Mr. V. D. Tagare, B. Ag. (Bom.), B. Sc. (Bom.).	13th August 1932	Recruited by the Director of Agriculture, Bombay Presidency.
5. Scheme for an Economic Enquiry into the cost of production of crops in the principal sugarcane and cotton tracts of India.	Provincial Officer in charge Economic Enquiry, Bombay, Poona.	Mr. T. B. Pawar, B. Ag. (Bom.).	1st April 1933 ..	Deputed from the Bombay Agricultural Department.
	Senior Assistant in Charge of Plant Section.	Mr. R. B. Gode, M.Sc. ..	18th October 1933	Transferred from the scheme financed from the funds of the Indian Central Cotton Committee.
	Superintendent, Dry Farming Research Scheme, Main-centre.	Mr. G. M. Bapat, M. Ag. ..	1st October 1933	Deputed from the Bombay Agricultural Department.
	Senior Assistant in Plant Section.	Mr. D. H. Gokhale, M. Ag.	12th October 1933	Recruited by the Director of Agriculture Bombay Presidency.

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
BOMBAY—*concld.*					
	Junior Assistant in Soil Section.	Mr. Y. S. Rane, B. Ag. ..	1st October 1933	Recruited by the Director of Agriculture, Bombay Presidency.	
Sub-centre at Bijapur.	Superintendent, Dry Farming Research Scheme, Sub-centre, Bijapur.	Mr. K. D. Gomaste, B. Ag.	Do. ..	Deputed from the Bombay Agricultural Department.	
	Junior Assistant at Bijapur.	Mr. G. B. Badami, B. Ag.	2nd October 1933	Recruited by the Director of Agriculture, Bombay Presidency.	
6. The Cold Storage Research Scheme.	Senior Research Assistant	Dr. D. V. Karmarkar, M. Sc. (Bom.), Ph. D. (Bristol), A.I.I.Sc.	1st March 1934 ..	Recruited by the Director of Agriculture, Bombay Presidency.	
	Junior Research Assistant.	Mr. B. M. Joshi, M.Sc. ..	1st March 1934 ..	Deputed from the Bombay Agricultural Department.	
	Senior Mechanic ..	Mr. C. L. Barve, B.E. (Mech.).	Do. ..	Recruited by the Director of Agriculture, Bombay Presidency.	
SIND.					
Economic enquiry into the cost of production of cotton in Sind.	District Supervisor, Hyderabad.	Mr. G. T. Nagrani B.Ag. (Bombay).	10th March 1933	Appointed by the Chief Agricultural Officer in Sind.	

BENGAL.

1. Rice Research Scheme.	Rice Research Officer ..	Babu Suresh Chandra Chakravarty, B.Sc. L.Ag.	1st June 1932 ..	Promoted from the Department.
	Rice Research Officer ..	Babu Kshitis Chandra Banerjee, B.A., L.Ag.	1st June, 1932 ..	Promoted from the Department.
	Assistant	Babu Jnan Ranjan Pal, B.Ag.	1st June 1932 ..	Recruited by the Department.
	Assistant	Mr. E. A. R. Banerjee, M.Sc.	9th December 1932.	Recruited by the Department.
	Assistant Chemist ..	Babu Sachindra Nath Sarkar., M.Sc.	16th July 1935 ..	Recruited by the Department.
2. Animal Nutrition Scheme.	Physiological Chemist ..	Babu Indu Bhusan Chatterjee, L.Ag.	2nd January 1932.	Promoted from the Department.
	Assistant Chemist ..	Mr. Md. Abdul Hai, M.Sc.	2nd January 1932	Recruited by the Department.
3. Scheme for Physical and Chemical Research into soils.	Physical Assistant ..	Babu Manindra Nath Chakladar, M.Sc.	1st June 1932 ..	Recruited through Public Service Commission (India).
4. Scheme for establishing sugarcane seedling testing station in Bengal.	Field Assistant ..	Babu Surendra Nath Bhattacharjee.	22nd July 1935 ..	Promoted from the Department.
5 Horticultural Scheme in Bengal.	Horticultural Officer ..	Mr. V. N. Vadhawkar, B.Ag.	9th April 1934 ..	Recruited through the Public Service Commission (India).
6. Scheme for economic enquiry into the cost of production of crops of the principal sugarcane and cotton tracts in India.	District Supervisor ..	Babu Nihar Kumar Gupta, L.Ag.	5th November 1934.	Promoted from the Department.
	Investigator	Babu Santi Priya Bose, B.Sc. (Edin.).	11th September 1933.	Promoted from the Department.

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
BENGAL—*contd.*					
7. Scheme for Appointment of marketing staff in Bengal.	Senior Marketing Officer	Mr. A. R. Malik, M.A., B.Sc. (Edin).	7th February 1935	Promoted from the Department.	
	Assistant Marketing Officer.	Babu Hiron Kumar Basak, L.Ag.	25th July 1935 ..	Promoted from the Department.	
	Assistant Marketing Officer.	Babu Kshitish Chandra Guha, B.Sc. (Edin.).	5th August 1935	Promoted from the Department.	
	Assistant Marketing Officer.	Mr. P. N. Ganguly, B.S.A. (OHIO) (U. S. A.), B.Sc. (London).	9th August 1935	Promoted from the Department.	
	Assistant Marketing Officer.	Moulvi Abdul Wahab Mollah, L.Ag.	20th July 1935 ..	Promoted from the Department.	
(8) Schemes for the Appointment of a Veterinary Investigation Officer in Bengal.	Veterinary Investigation Officer.	Mr. M. B. Mennon, G.B.V.C.	15th December 1932.	Recruited by the Imperial Council of Agricultural Research.	
(9) Scheme for systematic cultivation of medicinal plants and study of food poisons.	Botanist	Mr. R. L. Bahadwa, M.Sc.	13th April 1935 ..	Recruited by the Department.	
	Experimental Assistant	Dr N. N. Das, M.Sc., M.B.	13th April 1935 ..	Recruited by the Department.	
	Chemits	Mr. J. K. Lahiri, M.Sc. (Lon.), A. I. C.	13th April 1935 ..	Recruited by the Department.	
UNITED PROVINCES.					
10. Rice Research Scheme at Nagina.	Assistant Paddy Specialist.	Dr B. L. Sethi, M.Sc., Ph.D. (Aberystwyth).	13th April 1932 ..	Recruited through a Selection Board.	
	Farm Superintendent ..	B. Sanjai Singh (2 year course Agri. College).	1st March 1935	Promoted from the Department.	

	Research Assistant ..	Mr. T. R. Mehta, B.Sc. (Pusa trained).	1st March 1932..	Direct appointment.
	Research Assistant ..	Mr. P. S. Gupta, M.Sc.	13th August 1935	Direct appointment.
2. Scheme for an economic enquiry into the cost of cultivation of crops in the principal sugar cane and cotton tracts.	Supervisor	B. Kunai Singh, B.Sc. (Agri.).	9th February 1935.	Direct appointment.
	Supervisor	B. Budhi Prakash, M.A.	1st May 1933 ..	Direct appointment.
	Supervisor	B. Kedar Singh, Member, Subordinate Agricultural Service.	13th March 1934	Promoted from the Department.
3. Research into the development of the fruit Industry in the hills in U. P.	Soil Chemist ..	Dr. R. S. Gupta, M.Sc., Ph.D., A. I. C.	10th July 1934 ..	Recruited through the Public Service Commission (India).
	Horticulturist ..	Mr. R. S. Singh, B.Sc, (Reading), L.Ag.	10th July 1934 ..	Recruited through the Public Service Commission (India).
	Mycologist	Mr. Udai Bhan Singh, M.Sc.	10th July 1934 ..	Recruited through the Public Service Commission (India).
	Entomologist ..	Mr. Ram Narain Singh, L.Ag.	10th July 1934 ..	Recruited through the Public Service Commission (India).
	Assistant Entomologist	Mr. G. D. Bhat, B.Ag. ..	10th July 1934	Direct appointment.
4. Investigation into the problem of the sugar industry in the U. P.	Cane Physiologist ..	Dr. R. N. Mathur, M.Sc., P.H.D. (Agri.).	15th January 1934.	Direct appointment.
	Chemical Assistant ..	Mr. Iqbaluddin Hyder, B.Sc. (Bristol), Ag.	27th July 1935 ..	Direct appointment.
	Research Assistant	Mr. D. C. Agarwal, L. Ag. (post-graduate training, Pusa).	15th January 1934.	Promoted from the Department.
	Entomologist ..	Mr. B. D. Gupta, M.Sc. ..	15th January 1934.	Direct appointment.
	Cane Agronomist ..	Mr. Imdad Ali Khan, B.Sc. (Agri.) (Punjab).	14th December 1934.	Recruited through Public Service Commission (India).

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
UNITED PROVINCES—*contd.*					
5. U. P. Marketing Scheme.	Assistant Marketing Officer	Mr. P. L. Gaur, B.Sc.	12th June 1935	Recruited through the Public Service Commission.	
	Assistant Marketing Officer	Mr. Shri Ram Singh	1st June 1935 ..	Recruited through the Public Service Commission.	
	Assistant Marketing Officer	Mr. Rati Ram Kala	5th June 1935 ..	Recruited through the Public Service Commission.	
6. Dr. A. E. Slater's scheme of improvement of goats.	Assistant	S. Dardar Singh Bhatia, I. D. D.	15th October 1931.	Appointed by Dr. Slater.	
7. Appointment of Veterinary Investigation Officer in the United Provinces.	Veterinary Investigation Officer.	Mr. Harsh Bahadur Shahi, M.Sc., M. R. C. V. S., D.T.V.M.	4th April 1933 ..	Direct appointment ..	Was a state veterinary scholar of the United Provinces Government in the United Kingdom prior to his appointment as Veterinary Investigation Officer.
HARCOURT BUTLER TECHNOLOGICAL INSTITUTE, CAWNPORE.					
1. Grant to Harcourt Butler Technological Institute, United Provinces, for the Provision	Lecturer in Sugar Technology.	Mr. Abdul Rahim Khan, Dip. in Sugar Manufacture, R.T.C. (Glasgow).	23rd May 1928 ..	Appointment by the Department.	1. The Imperial Council of Agricultural Research gives a grant of Rs. 20,000 per annum for the

of an experimental sugarplant.					maintenance of the Sugar Factory. The pay of the staff is met from the budget of United Provinces Government.
	Assistant Research Chemist.	Dr. H. D. Sen, M.Sc., PhD. (London).	13th November 1916 and to the department 16th January 1922.	Appointed by the Department.	
	Assistant Research Chemist.	Mr. H. S. Chaturvedi, B.Sc., M.Sc. (L. A.) Dip. holder of H. B. T. I.	23rd May 1935	Appointed by the Department.	2. The grant to the Oil Section of the Institute is Rs. 30,000 for 1935-36 to maintain and run the Oil Section. The deficit of pay of the staff and other contingent charges are met from the budget of the United Provinces Government.
	Temporary Assistant in Sugar Factory.	Mr. K. C. Joshi, B.Sc., Dip. holder of H.B.T.I.	7th March 1933..	Appointed by the Department.	
	Offg. Workshop Superintendent.	Mr. Dhanpal Chandra, Dip. Mech. & Elec. Engg. (Roorkee), Dip. Mech. Engg. and Specialised in Cotton Spinning (Roorkee) and in Cotton Spinning (City and Guilds London Instt.).	15th August 1913	Appointed by the Department.	3. The Workshop Superintendent looks after the engineering work of both the sections.
2. Grant to Harcourt Butler Technological Institute, United Provinces, to maintain and run the Oil Section.	Head of the Oil Chemistry Section.	Mr. D. Y. Athawali, M. Sc. (offg.).	24th September 1934.	Appointed by the Department.	
	Lecturer in Oil Technology.	Dr. N. G. Chatterji, D.Sc., D. I. C., A.I.C., A.M.I., Cham. E., LL.B.	10th October 1919 and to the department 15th March 1921.	Appointed by the Department.	
	Assistant Research Chemist.	Mr. H. M. Mulany, M.Sc.	3rd February 1922	Appointed by the Department.	
		Mr. N. N. Bose, M.A., offg. (on leave).	15th February 1936	Appointed by the Department.	

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
PUNJAB.					
1. Sugarcane Research Scheme.	Sugarcane Specialist ..	S. Harbans Singh, B.Sc. (Agr.) (Punjab).	11th November 1934.	Promoted from the Department on the recommendations of the Public Service Commission.	
	Agricultural Assistant, A. Class.	Bh. Balwant Singh Butter, B.Sc. (Agri.).	24th January 1934.	Appointed by Director of Agriculture, Punjab, who is competent to make the appointment.	
	Agricultural Assistant, A. Class.	Bh. Atam Singh Kochhar, B.Sc. (Agri.).	1st February 1934.	Appointed by Director of Agriculture, Punjab, who is competent to make the appointment.	
	Agricultural Assistant, A. Class.	Bh. Dalbir Singh, B.Sc. (Agri.).	1st February 1934.	Appointed by Director of Agriculture, Punjab, who is competent to make the appointment.	
1. A. Sugarcane Research Scheme.	Agricultural Assistant, A. Class.	Bh. Sardul Singh, B.Sc. (Agri.).	1st February 1934	Appointed by Director of Agriculture, Punjab, who is competent to make the appointment.	
	Agricultural Assistant, A. Class.	M. Abdul Latif, B.Sc. (Agri.).	1st August 1934	Appointed by Director of Agriculture, Punjab, who is competent to make the appointment.	

2. Locust Research Scheme.	Agricultural Assistant, A. Class.	Mr. C. B. Mathur, M.Sc. (Zoology), Lucknow University.	2nd January 1931	Appointed by Director of Agriculture, Punjab, who is competent to make the appointment.	
	Agricultural Assistant, A. Class.	M. Abdul Haq, B.Sc. (Agri).	9th August 1933	Appointed by Director of Agriculture, Punjab, who is competent to make the appointment.	
3. *Cost of Cotton Crop Production Enquiry.	Agricultural Assistant, A. Class.	M. Niaz Mohammad, B.Sc. (Agri.).	1st April 1933 ..	Appointed by Director of Agriculture, Punjab, who is competent to make the appointment.	*The scheme is partly paid by the Imperial Council of Agricultural Research.
	Agricultural Assistant, A. Class.	Bh. Gurbachan Singh, B.Sc. (Agri.).	23rd October 1933	Appointed by Director of Agriculture, Punjab, who is competent to make the appointment.	
	Agricultural Assistant, A. Class.	Bh. Gurcharan Singh Sohi, B.Sc. (Agri.).	1st August 1934	Appointed by Director of Agriculture, Punjab, who is competent to make the appointment.	
4. Fruit and Vegetable Preservation Scheme.	Research Assistant ..	Dr. Girdhari Lal ..	8th November 1934.	Appointed by Director of Agriculture, Punjab, who is competent to make the appointment.	
5. Scheme for Improvement of Marketing in India.	Assistant Marketing Officer (Fruit).	S. Pritam Singh Diol, M.Sc. (Agri.) Mich. (U. S. A.).	15th March 1935	Promoted from the Department by the Punjab Government.	
	Assistant Marketing Officer (Livestock).	L. Harjas Rai, L. V. P. (Punjab).	15th March 1935	Promoted from the Department by the Punjab Government.	
	Assistant Marketing Officer (Oil seeds).	Ch. Zafar Alam, B.Sc. Agri. (Punjab) M.Sc. (London) F. L.S.	11th August 1935	Promoted from the Department by the Punjab Government.	

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
PUNJAB—*contd.*					
6. Appointment of a Veterinary Investigation Officer in the Punjab.	Veterinary Investigation Officer.	Mr. S. M. Sarwar, M. R. C. V. S.	1st October 1932	Selected by Director, Veterinary Services, Punjab, from amongst officers serving in the Civil Veterinary Department and selection approved by the Imperial Council of Agricultural Research on the recommendations of the Punjab Government.	
7. Parasitological Research to be undertaken at the Punjab Veterinary College, Lahore.	Veterinary Assistant ..	L. Karam Chand, L. V. P.	16th July 1934 ..	Selected by the Director, Veterinary Services, Punjab, on the recommendations of the Principal, Punjab Veterinary College, Lahore, out of the L. V. Ps., of the 1934 session.	
8. Dry Farming Research Scheme.	Agriculturist	L. Tehl Ram	1st July 1935 ..	Promoted from the Department by the Punjab Government.	
	Soil Physicist ..	L. Sukh Dayal, M.Sc. (Ph.).	1st July 1935 ..	Promoted from the Department on the recommendations of the Public Service Commission.	

	Plant Physiologist ..	Mr. I. M. Rao, M.A., M.Sc. (Madras).	14th March1936	Promoted from the Department on the recommendations of the Public Service Commission.	
	Agricultural Assistant, A. Class.	M. Mohammad Afzal ..	1st July 1935 ..	Appointed by Director of Agriculture, Punjab, who is competent to make the appointment.	
	Agricultural Assistant, A. class.	L. Girdhari Lal ..	1st July 1935 ..	Appointed by Director of Agriculture, Punjab, who is competent to make the appointment.	
BURMA.					
1. Rice Research Scheme	Rice Research Officer ..	Mr. J. W. Grant, M.A., B.Sc., I.A.S.	10th December 1932.	Promoted from the Burma Agricultural Department.	
	Assistant Rice Research Officer.	Mr. R. M. Row, B.A., M.Sc. (London).	6th February 1935.	Through the Public Service Commission.	
	Senior Agricultural Assistant.	U Thein Aung, Diploma in Agriculture.	6th July 1932 ..	Promoted from the Burma Agricultural Department.	
2. Marketing Scheme	Marketing Officer ..	Mr. F. D. Odell, M.A., I.A.S.	1st February 1935	Promoted from the Burma Agricultural Department.	
	Assistant Marketing Officer.	U Khin, B.Sc. (Horticulture).	1st February 1935	Direct appointment.	
	Assistant Marketing Officer.	U Hpu, Diploma in Agriculture.	8th February 1935	Promoted from the Burma Agricultural Department.	
	Assistant Marketing Officer.	U Kyin Sein, Diploma in Agriculture.	8th February 1935	Promoted from the Burma Agricultural Department.	
BIHAR AND ORISSA.					
1. Rice Research Scheme. (Sanctioned for 5 years from the 20th January 1932.)	Rice Specialist ..	Mr. M. Mahbub Alam, M.Sc. (Lucknow).	20th January 1932.	Deputed from the Bihar and Orissa Agricultural Department.	Economic Botanist deputed to work as Rice Specialist from the 20th January 1932.
	Assistant Botanist ..	Mr. A. Rashid Akhtar, M.Sc. (Punjab).	2nd April 1932 ..	Appointed by Local Government.	

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
BIHAR AND ORISSA—*contd.*					
	Assistant Botanist ..	Mr. Awadh Bihari Saran, M.Sc. (Agra).	16th September 1932.	Appointed by Local Government.	
	Senior Research Assistant.	Mr. P. D. Dixit, M.Sc. (Lucknow).	1st February 1932	Appointed by the Director of Agriculture, Bihar and Orissa.	
	Senior Research Assistant.	Mr. R. A. P. Trivedi, M.Sc. (Benares Hindu University).	5th December 1932.	Appointed by the Director of Agriculture, Bihar and Orissa.	
	Junior Research Assistant.	Mr. M. Anwarul Aziz Khan, B.Sc. (Agra).	20th February 1934.	Appointed by the Director of Agriculture, Bihar and Orissa.	
	Junior Research Assistant.	Mr. N. P. Chaudhury, M.Sc. (Lucknow).	3rd January 1933	Appointed by the Director of Agriculture, Bihar and Orissa.	
2. Sugarcane Research Scheme (Sanctioned for 5 years from 18th March 1932).	Sugarcane Specialist ..	Mr. K. L. Khanna, B.Sc., (Agri.), (Punjab).	18th March 1932	Recruited through Public Service Commission (India).	
	Physiological Assistant..	Mr. P. C. Raheja, M.Sc. (Agri.) (Punjab).	17th December 1933.	Recruited through Public Service Commission (India).	
	Chemical Assistant ..	Mr. Sailesh Chandra Sen, M.Sc.	23rd December 1933.	Recruited through Public Service Commission (India).	

	Botanical Assistant ..	Mr. Rama Rao Panje, M. A. (Madras).	2nd January 1934	Recruited through Public Service Commission (India).
3. Fruit Research Scheme. (Sanctioned for 5 years from the 3rd April 1934).	Horticulturist ..	*Vacant.*		
	Botanical Assistant ..	Miss Rajul Shah, B. Ag. (Bomb.), M.Sc., (Mich., U. S. A.).	22nd February 1935.	Appointed by the Director of Agriculture with the consultation of the Provincial Selection Board.
	Biochemical Assistant ..	Mr. Sheo Nath Prasad, M.Sc.	13th March 1935	Appointed by the Director of Agriculture with the consultation of the Provincial Selection Board.
4. Sugarcane Enquiry Scheme (Sanctioned for 3½ years from the 15th August 1935).	Supervisor	Babu Banshidhan Ghosh..	20th May 1935	Appointed by the Director of Agriculture, Bihar and Orissa.
	Supervisor	Mr. Krishnadeo Prasad ..	1st April 1935	Appointed by the Director of Agriculture, Bihar and Orissa.
5. Scheme of investigation on the possibilities of manufacturing 'Khandsari' sugar by the single pan Method. (Sanctioned for 3 years from the 2nd January 1935).	Graduate Assistant ..	Mr. Thakur Prasad, M.Sc.	2nd January 1935	Appointed by the Director of Agriculture, Bihar and Orissa.

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
BIHAR AND ORISSA—*contd.*					
6. Marketing Scheme, Bihar and Orissa (Sanctioned for 5 years from the 13th March 1935).	Senior Marketing Officer	(*a*) (*b*) Mr. B. N. Sarkar, L.Ag. (Sabour).	13th March 1935	Appointed by local Government.	(*a*) Deputy Director of Agriculture, deputed to work as Senior Marketing Officer. (*b*) Paid by the Government of Bihar and Orissa.
	Junior Marketing Officer	Mr. Promode Ranjan Hansdah Acharjee M.A., B.Sc. (Michigan).	1st June 1935 ..	Recruited through the Public Service Commission (India).	
	Junior Marketing Officer	Mr. Mani Lal Harinarayan Jain, B.Sc. (Edin.) M. D. D.	28th May 1935 ..	Recruited through the Public Service Commission (India).	
	Junior Marketing Officer	Mr. Premchandra Varma, B.Sc. Ag.	24th May 1935 ..	Recruited through the Public Service Commission (India).	
	Junior Marketing Officer	(*c*) Babu Madan Mohan Pradhan.	29th March 1936	Appointed by the Director of Agriculture Bihar Bihar and Orissa.	(*c*) Sanctioned for three months.
7. (Veterinary) Scheme for investigation of diseases.	Veterinary disease Investigation officer.	Mr. Lakshmi Sahai, M. Sc. (Allahabad) M.R.C.V.S.	2nd May 1932 ..	Appointed by the local Government on the recommendations of the Provincial Selection Board.	

1. Scheme for the improvement of rice cultivation in the Central Provinces.	Bio-chemist	Dr. B. R. Mukerjee, Ph. D., D.Sc.	9th September 1932.	Recruited through the Public Service Commission (India).
	Botanist	Mr. B. B. Dave, L. Ag. ..	1st September 1932.	Selected from the Department by the Public Service Commission.
	Assistant	R. G. Joglekar, B. Ag. ..	18th November 1932.	Recruited locally.
	Assistant	S. L. Vishnoi, B. Ag.	23rd June 1933 ..	Recruited locally.
	Assistant	Mr. H. P. Misra, B. Ag.	18th November 1934.	Recruited locally.
	Assistant	Mr. S. N. Walkada, B. Ag.	29th July 1935 ..	Recruited locally.
2. Scheme for an Economic Enquiry into the cost of production of cotton crop.	Provincial Officer ..	P. D. Nair, M.A., L.Ag., (Hon.) (Post Graduate, Pusa).	1st May 1933 ..	Promoted from the Department.
	District Supervisor ..	B. G. Khandekar, B.Ag.	29th May 1933 ..	Promoted from the Department.
	District Supervisor ..	K. R. Dube, B.Ag. ..	29th May 1933 ..	Recruited locally.
	District Supervisor ..	D. R. Dhodapkar, M.Sc., B.Ag.	8th January 1934.	Recruited locally.
3. Scheme for the improvement of Marketing in India.	Assistant Marketing Officer.	G. D. Mehta, B.Ag. ..	11th February 1935.	Promoted from the Department.
	Assistant Marketing Officer.	A. X. Rebello, B.Ag. ..	5th February 1935.	Promoted from the Department.
	Assistant Marketing Officer.	N. S. Pathak, G.B.V.C. ..	2nd February 1935.	Promoted from the Veterinary Department.
4. Investigation of animal diseases in the Province.	Veterinary Investigation Officer.	Mr. Bachan Singh, M.R.C.V.S.	20th June 1932 ..	Recruited through the Public Service Commission.

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
CENTRAL PROVINCES —*contd.*					
5. Vaccination of cattle against rinderpest.	Senior Veterinary Assistant Surgeon.	Mr. G. D. Pani, G.M.V.O...	15th March 1935	Appointed from the Department.	
	Veterinary Assistant Surgeon.	Mr. P. S. Nair, G.V.Sc. ..	15th March 1935	Fresh Appointment.	
	Veterinary Assistant Surgeon.	Mr. C. G. Kurian, G.V.Sc.	15th March 1935	Fresh appointment.	
	Veterinary Assistant Surgeon.	Mr. S. B. Balkrishna, G.M.V.C.	15th March 1935	Fresh appointment.	
	Veterinary Assistant Surgeon.	Mr. N. Hanumanth Rao, G.M.V.C.	15th March 1935	Fresh appointment.	
	Veterinary Assistant Surgeon.	Mr. V. Srinivasan, B.A., G.M.V.C.	15th March 1935	Fresh appointment.	
	Veterinary Assistant Surgeon.	Mr. S. R. Nadgir, L.V.P.	15th March 1935	Fresh appointment.	
	Veterinary Assistant Surgeon.	Mr. Raghunath Prasad G.B. & O.V.C.	15th March 1935	Fresh appointment.	
	Veterinary Assistant Surgeon.	Mr. Ram Deni Prasad, G.B. & O. V.C.	15th March 1935	Fresh appointment.	
	Veterinary Assistant Surgeon.	Mr. B. N. Swamy, G.B. V.C.	21st March 1935	Fresh appointment.	
	Veterinary Assistant Surgeon.	Mr. A. Subbarao, G.M.V.C.	21st March 1935	Fresh appointment.	
ASSAM.					
1. Investigation of animal diseases in Assam.	Veterinary Investigation Officer, Assam.	Pandit Gajanan Pande, M.Sc., M.R.C.V.S.	16th April 1933 ..	Recruited through the Public Service Commission.	
2. Sugarcane Research Scheme, Jorhat.	Chemical Assistant ..	Babu Hemendra Nath Pal, M.Sc. (Chemistry).	3rd October 1933.	Appointed by the Director of Agriculture.	

3. Deep Water Paddy Farm, Habiganj, Sylhet.	Economic Botanist ..	Mr. S. Majid, B.Sc.	13th September 1934.	Recruited locally.
	Botanical Assistant ..	Babu Sashindra Chandra Bhattacharji, B.Ag.	24th October 1934.	Transferred from General Cadre.
NORTH-WEST FRONTIER PROVINCE.				
1. Improvement of marketing in the North-West Frontier Province.	Assistant Marketing Officer.	Ch. Ghulam Qadir, P.V.S.	10th May 1935 ..	Direct appointment.
	Assistant Marketing Officer.	Mr. Sapra, B.A., Economics.	1st May 1935 ..	Direct appointment.
2. (Veterinary) Scheme for investigation of disease.	Disease Investigation Officer.	Mr. S. R. Chadda, B.Sc., M.R.C.V.S.	7th October 1935.	Direct appointment.
HYDERABAD STATE.				
1. Scheme for an Economic Enquiry into the cost of production of crops.	District Supervisor ..	Mr. V. K. Joshi, B.Ag. ..	15th April 1933 ..	Direct appointment.
2. Dry Farming Research Scheme.	Senior Assistant ..	Mr. P. K. Savanur, B.Ag...	4th July 1934 ..	Promoted from the Department.
3. Castor Research Scheme.	Technical Assistant ..	Dr. L. G. Kulkarni, Ph. D.	6th September 1935.	Direct appointment.
	Technical Assistant ..	Mr. N. G. Masur, B.Ag. ..	10th October 1935.	Services obtained from Bombay Government.
MYSORE STATE.				
1. Scheme for the Investigation of Fish Poisons and other Indian Forest Products.	Assistant Entomologist.	Mr. M. Puttarudriah, B.Sc. (Hons.).	20th December 1934.	
	Assistant Chemist ..	Mr. K. Lakshminarayana Bhatta, B.Sc.	20th December 1934.	
2. Sugarcane Research Scheme (Breeding of Thick Canes).	Senior Assistant Botanist.	Dr. L. S. Dorasami, B.Sc. (Hons.), M.Sc. (Lond.), Ph. D. (Lond.).	1st February 1933.	
	Junior Assistant Botanist.	Mr. M. L. Subbanna, B.Sc. (Hons.).	1st February 1933.	

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
MYSORE STATE—*contd.*					
3. Investigation of Johne's Disease Research Scheme.	Veterinary Inspector ..	Mr. K. Srinivasa Murthy, B.Sc., L.V.P.	21st January 1935.		
4. Economic Enquiry into the cost of production in the Principal Sugarcane and Cotton growing tracts in India.	District Supervisor ..	Mr. C. V. Krishna Murthi	1st April 1933.		
BARODA STATE.					
Economic enquiry into the cost of production of crops in the principal sugarcane and cotton tracts.	District Supervisor ..	Mr. Anantrai Atmaram Mohta, B.Ag.	17th June 1935 ..	Appointed from the Department.	
CALCUTTA UNIVERSITY.					
Properties of Colloid Soil Constituents.	Senior Research Assistant	Mr. Ramprasad Mittra, M.Sc.	1st November 1935.	Direct appointment.	
	Junior Research Assistant	Mr. Sudhamoy Mukerjee, M.Sc. (Calcutta).	7th December 1935.	Direct appointment.	

DACCA UNIVERSITY.

1. Dacca University scheme of research on the mechanical analysis of lateritic soils and on the nutrition of the rice plant.	Senior Assistant (Bio-Chemist).	Mr. P. K. De. M.Sc., A.I.I.Sc.	11th August 1930	Appointed through a Selection Board.	
	Assistant in Soil Chemistry.	Mr. J. N. Chakravarty, M.Sc., Post Graduate Diploma, Pusa.	11th August 1930	Appointed through a Selection Board.	
	Junior Assistant ..	Mr. P. B. Bhattacharyya, M.Sc.	1st December 1933.	Appointed through a Selection Board.	
		*Mr. K. P. Ganguli, M.Sc.	1st October 1934.	Appointed through a Selection Board.	*Appointed *vice* Mr. P. B. Bhattcharya granted leave without pay up to 31st March 1936.
	Typist Assistant ..	Mr. Muhammad Hatem Ali, B.Sc.	11th November 1935.	Appointed through a Selection Board.	
2. Scheme for investigation on organic constituents of Indian Soils.	Research Assistant in Agricultural Chemistry.	Dr. A. C. Bose, Ph. D., A.I.C.	12th November 1934.	Appointed through a Selection Board.	

AGRA UNIVERSITY.

1. Investigation on "Cereal Rusts".	Senior Research Assistant	Mr. Raghubir Prasad Gupta, M.Sc., (Agra), Botany with special paper on parasitic Basidiomycetes (including rusts).	1st April 1935.		
	Personal Research Assistant.	Dr. K. P. V. Menon, B.Sc. (Bombay), Ph. D. (Lond.), D.I.C. (Lond.)	23rd November 1935.		
	Research Assistant ..	Mr. Shyama Lal Sharma, M.Sc. (Agra.) — Botany with special paper on parasitic Basidiomycetes (including rusts).	1st April 1935.		

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
AGRA UNIVERSITY—*contd.*					
1. Investigation on "Cereal Rusts"—*contd.*	Research Assistant ..	Mr. H. L. Gulatia, B.Sc. (Punjab) — Botany, B. Sc. (Hons.) Sch., M.Sc. (Hons. Sch.) (Punjab) Botany.	1st April 1935.		
	Research Assistant ..	Dr. R. P. Asthana, M.Sc. (Allahabad) Ph. D. (Lond.) D.I.C. (Lond.)	14th December 1935.		
	Research Assistant ..	Mr. J. L. Merh, M.Sc. (Allahabad).	10th May 1935.		
	Research Assistant ...	Mr. R. S. Mathur M.Sc. (Lucknow).	26th September 1935.		
	Junior Research Assistant	Mr. Ram Piyara Mal, B.Sc. (Ag.) (Lyallpur).	1st April 1935.		
	Junior Research Assistant	Mr. V. P. Gokhale, B.Ag. (Bombay).	23rd May 1935.		
	Wheat Breeding Assistant	Mr. M. Abdul Aziz, B.Sc. (Ag.) (Punjab) Pusa trained.	7th April 1935.		
	Assistant Survey (Punjab).	Sardar Dyal Singh Johar, M.Sc. (Punjab).	19th June 1935.		
	Assistant Survey (Bombay).	Mr. B. S. Varada Rajan, B. Ag. (Bombay).	16th August 1935.		
	Assistant for Survey (Madras).	Mr. T. V. Pattabhiraman, B.Sc. Ag. (Madras).	10th October 1935.		
	Meteorological Assistant	Mr. Gulab Chand Goyal, M.Sc. (Agra).	15th July 1935.		

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FOR 1936-37.

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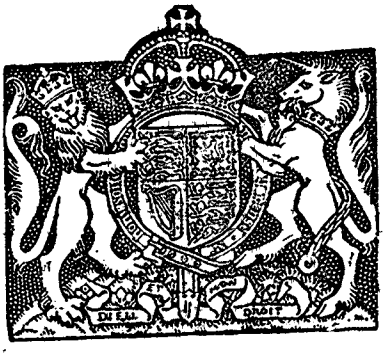

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Annual Report of the Imperial Council of Agricultural Research for 1936-37.

The seventh annual report of the Imperial Council of Agricultural Research covers the period from 1st April 1936 to 31st March 1937.

1. *Personnel of the Council.*—Sir Bryce C. Burt continued to officiate as Vice-Chairman except from 31st August to 10th December, 1936, when he was on leave. During that period Mr. N. C. Mehta, Secretary, officiated as Vice-Chairman and Mr. Bazlul Karim acted as Secretary to the Council. Consequent on the demise of Dr. F. J. F. Shaw, Officiating Agricultural Expert, Dr. W. Burns, Director of Agriculture, Bombay, was appointed to officiate as Agricultural Expert on 24th August 1936. Col. A. Olver (now Sir Arthur Olver) went on four months' leave in March 1937 and Mr. F. Ware, Director, Imperial Veterinary Research Institute, Muktesar, has officiated as Animal Husbandry Expert since. The composition of the Governing Body, the Advisory Board and the Council's Secretariat at the end of the year is shown in Appendix I.

2. *Indian States.*—There has been no addition to the membership of the Council from the ranks of the Indian States.

3. *Meetings of the Council.*—The Advisory Board met twice and the Governing Body met once during the year. The Annual General Meeting of the Council took place on the 30th January 1937, when the annual report on the working of the Council including the accounts for 1935-36 were adopted. An important decision was taken by the Governing Body in regard to provincial contributions to research schemes. It was decided that such contributions should be fifty per cent. of the total cost unless there were adequate reasons to the contrary.

4. *Finance.*—The following grants were received during the year from the Government of India:—

	Rs.
(a) Annual grant for research work	5,00,000
(b) Grant for sugar research	1,75,000
(c) Grant for expenditure on provincial portion of the marketing scheme	2,00,000
(d) Special grant (including a sum of Rs. 10 lakhs) representing the balance of the block grant of Rs. 25 lakhs promised to the Imperial Council of Agricultural Research at the time of its establishment .	21,36,476

5. *Scientific stock-taking.*—The scientific stock-taking of the research activities of the Council, reference to which was made in the previous Report, was carried out during the year by Sir John Russell, D.Sc., F.R.S., Director of the Rothamstead Experimental Station, and Dr. N. C. Wright, M.A., Ph.D., Director, Hannah Dairy Research Institute. Mr. R. L. Sethi and Captain A. C. Aggarwala acted as their Secretary-Advisers, respectively. The reports of Sir John Russell and Dr. wright are expected sometime during August.

6. *British Commonwealth Scientific Conference.*—In accordance with the recommendations of the Imperial Committee on Economic Consultation and Co-operation, the British Commonwealth Scientific Conference assembled in London in September 1936. The participating Governments agreed that the conference should consider and report on the following subjects:—

(*i*) Organizations controlled by the Executive Council of the Imperial Agricultural Bureaux:—

(*a*) the work, finance, direction and possible extension of usefulness of the—

Imperial Bureau of Soil Science,

Imperial Bureau of Animal Health,

Imperial Bureau of Animal Nutrition,

Imperial Bureau of Plant Genetics (for Crops other than Herbage),

Imperial Bureau of Plant Genetics (Herbage Plants),

Imperial Bureau of Fruit Production,

Imperial Bureau of Animal Genetics,

Imperial Bureau of Agricultural Parasitology,

Imperial Institute of Entomology,

Imperial Mycological Institute.

(*b*) the work of the Farnham House Laboratory on biological control of pests,

(*c*) the future arrangements for the Journal of Dairy Research.

(*ii*) Proposals which had been put forward by one or more governments for new bureaux in dairy science and forestry respectively.

(*iii*) Proposals directed to ensure fuller co-operation in scientific research.

(*iv*) Proposals for collaboration in the collection and maintenance of plant material required for crop improvement.

(*v*) Research activities aided through the Executive Council, including the nature and extent of future co-operation in respect of research into the—

(*a*) transport and storage of foodstuffs,

(*b*) control of insect infestation in stored products,

(*c*) properties and utilization of wool.

(*vi*) Co-operative investigation of methods for the control of damage by termites.

(*vii*) Research—interchange of workers and of programmes.

(*viii*) Interchange of information on research into building materials and methods.

(*ix*) Feasibility and advisability of periodical specialist conferences either in connection with the bureaux or otherwise, and of a Commonwealth Scientific Conference on Agriculture.

(*x*) Feasibility and advisability of a General Scientific Conference.

(*xi*) Questions arising from the Third Mycological Conference, 1934, as to:—

(*a*) Uniformity in health certificates accompanying exports of living plants.

(*b*) Research work towards standardization of methods for testing the efficacy of fungicides and insecticides.

India was represented at the Conference by:—

Sir Bryce C. Burt, C.I.E., M.B.E., Offg. Vice-Chairman, Imperial Council of Agricultural Research (Leader of the Delegation),

Sir C. G. Trevor, C.I.E., Inspector General of Forests,

Lieut.-Col. G. G. Jolly, C.I.E., M.B., Ch.B., I.M.S., Acting Public Health Commissioner with the Govt. of India.

Participation in the conference was of particular significance to the Imperial Council of Agricultural Research which makes substantial contributions towards the financing of the Imperial Agricultural Bureaux and allied institutions—a subject of prominent interest to the Conference. The Conference placed on record their considered view regarding the work and usefulness of the Bureaux as affording an example of effective co-operation in a true intra-Imperial basis. The conference provided valuable opportunities to the representatives of India for making, renewing and cementing valuable contacts with those engaged in comparable work throughout the Commonwealth.

7. *Cold Storage Project.*—In December 1935, a proposal was initiated by the Defence Department for the erection of Cold Storage in certain military stations in Northern India. As the Imperial Council of Agricultural Research is also interested in the improved transport and storage of agricultural produce and has been financing experiments on the cold storage of fruit, it was decided that its service should be utilised in the organisation of research into the best methods of refrigeration—both in store and in transport. The Government of India undertook to place the Council in funds upto about one lakh for this purpose. It is also expected that the Defence Department will incur some expenditure from its own budget on experimental work. An inter-departmental standing committee has also been set up to effect liaison and co-operation in the development of cold storage on which the Vice-Chairman and the Agricultural Marketing Adviser to the Government of India represent the Imperial Council of Agricultural Research. This co-operation with the Defence Department especially in regard to research on specific biological problems is particularly welcome as it offers additional resources and greater opportunities to the Imperial Council of Agricultural Research in a matter which should eventually be of considerable importance to the Indian producer of perishable foodstuffs.

8. *An outline of the Council's activities on Animal Health and Animal Husbandry.*—The usual activities of the Council in matters concerning the improvement of Indian livestock received considerable impetus during the year under report owing to His Excellency the Viceroy's keen personal interest in the welfare of cattle in India. His Excellency took early opportunities to address the members of the Advisory Board and those of the Governing Body of the Council and, in doing so, gave valuable practical hints for the purpose of formulating a sound breeding policy designed to secure better working bullocks and a better milk supply for the general population and so effect an improvement in the nutrition of the people.

Immediately on arrival in this country, His Excellency presented three pedigree breeding bulls to Delhi Province and provided funds for their maintenance. This step was hailed with enthusiasm and his example was followed all over the country by persons of wealth, standing or influence. His Excellency also purchased from the city dairies in Calcutta and Bombay half a dozen 'dry' cows and one buffalo—which were normally doomed for sale to the butcher—brought them to Delhi and presented them to the local Pinjrapole for breeding experiments.

The result of all these activities has been that today the improvement of cattle has become an important feature in all provincial schemes of rural development. New Associations, new funds are cropping up everywhere. Various meetings all over the country have discussed His Excellency's scheme and the creation of Animal Husbandry Departments in the provinces is being considered. The reaction on the centre resulted in the initiation of and enquiry in villages regarding the condition of cattle and the relationship between the production and consumption of milk by the cultivators. Further details of this and other schemes of work initiated and financed by the Council are given below.

(*i*) *The Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry.*—The second meeting of the above body was held in Madras in December 1936, by invitation of the Government of Madras. His Excellency the Governor of the Presidency was pleased to open the Conference and attended the first session which was devoted to a discussion of the better utilisation of forest areas for grazing purposes. An important feature of the conference was the presence of, and participation in its proceedings by, two eminent experts, *viz.*, Sir John Russell, Director, Rothamstead Agricultural Research Station and Dr. N. C. Wright, Director of the Hannah Dairy Institute, Ayr.

The discussions embraced several important matters, such as veterinary education, animal health, animal breeding, animal industry, animal nutrition and dairying. The combating of such diseases as rinderpest, measures to give effect to His Excellency the Viceroy's cattle improvement scheme, the marketing of such animal products as hides and skins, and nutrition problems engaged the special attention of the conference. Matters like dairy legislation and international conventions relating to the trading in livestock products also came under scrutiny at the conference. Some of these matters are dealt with separately in this Report. The decisions reached on the others are briefly indicated below.

(*a*) *Castration, Vaccination, etc.*—For carrying out castration, vaccination, and other livestock improvement work, properly trained stockmen working under veterinary supervision should be employed to supplement the work of the provincial veterinary departments.

(*b*) *Revision of the forms for collecting all-India statistics.*—In order that they may be more useful than at present, the forms and tables for collecting all-India statistics relating to livestock were revised.

(*c*) *Rinderpest.*—The questions whether goat virus alone should be used for general prophylaxis or for control of outbreaks only and whether it is possible to establish "Rinderpest free areas" in this country and, if so, what measures will be necessary in the event of the accidental appearance of the disease in such areas after a long period of immunity, were reserved for further examination. So far as the control of outbreaks is concerned, the Goat Virus or Vaccine methods may be adopted in the case of cattle. The application of these methods to buffaloes requires further research and for the present a controlling dose of Serum should be used simultaneously with the Virus or Vaccine. All good cattle and buffaloes and improved stock should receive prophylactic treatment and India should be mapped out to show the areas in which Rinderpest is enzootic.

(*d*) *Prophylactic inoculation against Blackquarter.*—An officer with special knowledge of the pathogenic anaerobes affecting domestic animals should be appointed. Diagnosis of outbreaks should be carried out at provincial laboratories and confirmed by a specialist. Mapping out enzootic areas in provinces, according to the causal organism, should be carried out.

(*e*) *Incidence and control of diseases among sheep and goats awaiting exportation.*—It was decided to instruct Disease Investigation Officers to make further investigations in provinces in regard to the incidence and control of diseases of sheep and goats which are important from the point of view of export. Special study of the problem at a later stage in the Central Institute was contemplated.

(*f*) *Quarantine stations at Ports*:—It was decided that the note on the establishment of quarantine stations at the principal Indian ports should be considered by the committee which dealt with the Contagious Diseases of Animals (India) draft Act and thereafter circulated to provinces for eliciting opinion thereon.

(*g*) *Improvement of sheep-breeding.*—With a view to improving the sheep breeding industry on a large scale, the first requisite would be to induce owners of non-migratory flocks to take up the breeding of pure bred indigenous sheep. Provinces should maintain, as far as possible, at a central farm, nucleus flocks of all indigenous breeds which are of economic importance to the province. In order to popularise the scheme in districts, demonstration flocks of these breeds consisting of about fifty ewes and two rams in each group, might be sent to selected breeders for breeding pure-bred stock under suitable controlled conditions. The financing of such demonstration flocks would be an object on which a portion of village uplift funds could justifiably be expended.

(*h*) *Cattle Dips*:—It was decided that information regarding the use of dips and the results achieved should be obtained from Military Dairy Farms, the Government Cattle Breeding Farm, Karnal, and other farms, and that the Concrete Association of India should be asked to furnish information regarding the design and cost of dips and as to whether and, if so, what facilities they would be prepared to give, should it be decided

to provide for dips in this country on an extensive scale. It was also considered necessary to establish demonstration dips at Government Cattle breeding farms for propaganda purposes.

(*i*) *Branding of Animals*:—Approved cattle of the category of selected improved stock should be branded on the cheek with a specified mark and further marking for individual identification, if necessary, should be done by tattooing the ear. If branding is to be done on the hides it should be done on the neck.

(*j*) *Artificial Insemination.*—With the establishment of an Animal Genetics Institute the application of the methods of artificial insemination, which have proved so successful in other countries, should be studied.

(*k*) *Classification of working animals.*—It was decided to postpone the consideration of the question of classifying working animals into light, medium and heavy, according to measurements, age, etc., until the complete cattle survey report was received from the Agricultural Marketing Adviser to the Government of India. It was decided that the annual calendar of fairs should include information about the rate of fee charged for each animal allowed into the ground of cattle fairs and markets and that the question of the licensing of brokers for recognised cattle fairs and markets shuld be examined.

(*l*) *Grading of Wool.*—A simple system of grading wool should be devised for the proper development of the wool industry. Facilities for washing sheep may be provided at sheep shearing centres, but the report of the marketing survey should be awaited before carrying out a wool survey.

(*m*) *Fodder crops.*—It was decided that the questionnaire prepared by the Animal Nutrition Committee for obtaining information about the fodder crops available for the stock of each province, preferably district by district, should be examined by a sub-committee of the Advisory Board before circulation.

(*n*) *Equine abortion in Indian studs.*—Information should be collected from private and Government stud farms as to the occasions on which the disease in question appeared, the treatment from the nutritional point of view and the results obtained therefrom. The Central Institute of Animal Nutrition should investigate scientifically the cause of the disease.

(*o*) *Mineral Feeding.*—The Central Institute of Animal Nutrition should investigate the mineral requirements of dairy animals up to the fourth lactation in conditions of health. Special attention should be paid to cases of malnutrition due to mineral deficiencies. The Institute should also render assistance to the provinces.

(*p*) *Improvement of the Dairy Industry.*—The time is ripe for the formation of breed and milk-recording societies as an aid to developing the dairy industry of the country. The public should be educated in the advantages of using pedigree stock. Propaganda for this purpose can best be carried out through a central agency, and it was recommended that the necessary facilities for the purpose should be provided.

(*q*) *Registration of Animals.*—The Central Pedigree Herd Books should deal with seven milch breeds of cattle of all-India importance and should lay down forms, methods, rules, etc., for registration of such breeds to be followed by the provinces. The application for registration should be

made to provincial organisations who after preliminary verification should pass it on to the Central organisation with recommendations. To accelerate the movement, registration after the starting of the Herd Book might be made free of charge for the first eighteen months. Thereafter a fee of about Rs. 2 per animal might be levied.

(*r*) *Buffaloes in the Dairy Industry.*—The time has come for paying more attention to the development of the various breeds of buffaloes, especially the important breeds.

(*s*) *Burdizzo Castrator.*—The use of the Burdizzo Castrator should be extended and villagers trained in its use under veterinary supervision.

(*t*) *Statistics in Research.*—The Statistician should prepare a note dealing with the elementary aspects of statistics in relation to Animal Husbandry and Veterinary problems and assist any research worker in the lay-out of any particular set of experiments. In particular, he should advise as to how far the results likely to be obtained from such research would be amenable to statistical interpretation. The Statistician or his deputy should be employed to lecture to the post-graduate class held annually at Muktesar.

(*ii*) *Review by Dr. Wright of the Council's activities in relation to the dairy industry.*—As stated in last year's report, the importance of periodical stock-taking of the council's work cannot be over-rated; and, while chalking out a definite plan for attacking the divers problems emerging out of the Council's various research schemes and activities, it was found essential to undertake a scientific survey of its entire research programme. In the domain of dairying the duty of such retrospection and the responsibility for suggesting the possible lines of future development were entrusted, on the recommendation of the Secretary of State for India, to an eminent scientist, Dr. N. C. Wright, Ph.D., Director of the Hannah Dairy Institute, Ayr, Scotland.

Dr. Wright visited various places of interest in India, obtained first-hand information regarding the prevalent conditions under which the dairy industry in this country was being run and made a special study of the conditions obtaining in the Imperial Dairy Institute at Bangalore and at Anand, the two places selected for the location of future research work in this subject. In addition, his expert advice was made available to several provinces and States. Dr. Wright's recommendations are expected shortly and it is hoped that the valuable advice he is expected to give will make it possible for the dairy industry in this country to be placed on a sound foundation.

(*iii*) *Utilization of forest areas for grazing.*—For any campaign of live-stock improvement, to achieve any real measure of success, the problem of a more adequate food supply must simultaneously be tackled. A better utilisation of forest areas for grazing purposes is often claimed to be one of the most important methods for supplementing the available food-stuffs for the cattle. This question was examined by a committee of senior forest officers who met in Madras in December 1936 prior to the meeting of the Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry. The Committee reached the conclusion that there was scope for the improvement of grazing in certain types of forest some of which are under the control of the Forest Department, but that the greatest scope for development lies in the improvement of forest

scrub and waste land outside the reserved forests. The committee recommended the setting up of a Fodder and Grazing Committee in each province. This recommendation was accepted by the Animal Husbandry Wing. It is proposed that these committees should undertake the reclassification of waste lands outside Government forests and select areas capable of improvement for the production of fodder or for use as grazing grounds. They would also advise the Provincial Governments as to the best agency for the management of such lands, and to indicate the lines along which investigations are needed and improvements in management are required. It is proposed that their work should be co-ordinated by a special Fodder and Grazing Committee of the Imperial Council of Agricultural Research.

It is hoped that the provincial committees will be set up without delay, so that their representatives at meetings of this last mentioned body will be in a position to describe the special problems in each province and arrive at general conclusions in regard to the main lines of improvement to be followed throughout India.

(*iv*) *Pedigree Herd Books.*—A reference was made in the previous report to a scheme for the official definition of breed characteristics of seven of the most important breeds of Indian dairy cattle. Conveners for each breed of cattle have since been appointed and funds placed at their disposal which will enable them to assemble breeders and to draw up schedules of breed points. Reports from the conveners are due by the end of June 1937.

(*v*) *Salvage of dry city cows.*—The practice alleged to be prevalent in cities of slaughtering dry cows and buffaloes engaged the personal attention of Colonel Sir Arthur Olver, who made a thorough study of the problem with particular reference to the conditions obtaining in the presidency towns of Madras, Bombay and Calcutta which he visited for the purpose. The result of his investigations was considered by the Board of Agriculture and Animal Husbandry in India at the second meeting of the Animal Husbandry Wing held in Madras in December 1936. Subsequently a small sub-committee of the Advisory Board was appointed to examine the question. The measures which, in the opinion of the Committee, may be adopted with advantage with a view to checking the alleged malpractice and improving the general conditions are summarised below:—

(*a*) Control of milk supply in cities, *e.g.*, by issuing licences to sell milk only to men of substance and discontinuing the issue of such licences to hawkers;

(*b*) Production of milk outside city limits and tightening up the administration of the Food and Drugs Act.

(*c*) Railway facilities for transport of dairy produce and the establishment by Municipalities of milk-selling centres.

(*d*) The development of such special dairy areas at that recently established at Palghar for the supply of milk to Bombay city.

(*e*) Breeding in Gowshalas and Pinjrapoles of improved cattle on approved lines.

(*f*) The Registration of cattle imported into cities.

(*g*) Deterrent punishment for such malpractices as Phuka and the starvation of calves.

The above recommendations have been commended to Provinces and Constituent States for such action as they may desire to take and the Railway Board has been requested to invite Railways in India to consider sympathetically any proposals emanating from Provinces in this direction. With the co-operation of Provincial Governments, Constituent States, Municipalities and other Local bodies, it is hoped that the long-standing evil will be gradually eradicated.

(*vi*) *The Eleventh World Dairy Congress, 1937.*—With the object of improving the dairy industry by co-operative and practical methods and of uniting for the purpose all countries interested in the problem, annual sessions of the world congress are organised by the International Dairy Federation, which was founded on the occasion of the First World's Dairy Congress at Brussels in 1903. India was represented at the Congress in 1931 and in 1933. It has been decided that India should be represented at the Congress to be held at Berlin in August 1937 and that the delegation should consist of Sardar Bahadur Datar Singh (Proprietor, Montgomery Dairy Farm) and Messrs. F. Ware (Director of the Imperial Veterinary Research Institute), E. J. Bruen (Livestock Expert to the Government of Bombay) and F. J. Gossip (Livestock Expert to the Government of Bengal),—all of whom are expected to be in the United Kingdom at the time. The necessary funds for the purpose have been provided. The report of the delegation will be considered in due course.

(*vii*) *Dairy Diploma Course.*—While certain facilities for imparting dairy training to students of this country at present exist, it is doubtful whether the courses can be regarded as satisfying modern scientific requirements. Accepting the view that dairy technology in India needs to be developed through a process of natural evolution suited to Indian conditions instead of by the adoption of a system such as that existing in the United Kingdom for instance, the question which, at the instance of the Government of India in the Department of Education, Health and Lands, the Imperial Council of Agricultural Research had to consider was how to improve the existing arrangements for training and to raise the standard thereof.

A sub-committee of the Council went into the question in detail and took in hand the drafting of a suitable syllabus. The problem was, however, beset with a serious difficulty. While the Royal Commission on Agriculture contemplated that dairy instruction should be purely a provincial concern, Provincial Governments themselves were unable for various reasons to shoulder the responsibility. There appeared to be no option but to leave the elementary training in dairying in the hands of the provincial authorities and the existence of provincial agricultural and veterinary institutions, *e.g.*, the Agricultural Colleges at Nagpur, Allahabad, Poona, Coimbatore and Lyallpur and the Veterinary College at Patna all with facilities for imparting such training, was a strong argument in support of the view. It appeared feasible, however, that, after a reasonable interval, the training given at the Bangalore Institute might be raised to the standard of advanced training in dairy technology, *i.e.*, to something in the nature of a higher course of a post-graduate character.

The necessity for raising the elementary standard was also accepted and it was contemplated that there should be a common examining body and a common competitive examination for admission to the higher course at Bangalore, or any similar Institute which may in the future come into

being. The board demarcation would be that the administrative and financial arrangements in connection with elementary and higher training would be the responsibility of the Provincial Governments and the Central Governments, respectively.

The draft syllabuses for both categories of training were scrutinised by the sub-committee.

On certain matters of detail it was considered advisable, however, to invite the expert views of Dr. Wright, and pending the receipt of Dr. Wright's report, it was decided that the sub-committee should continue to hold office.

(*viii*) *Adulteration of dairy products.*—Since the almost universal practice of adulterating dairy products is a menace both to public health and to the future of the dairy industry, the Imperial Council of Agricultural Research took the earliest opportunity of considering what measures should be adopted to eradicate this evil. The possibility of penal legislation of a central character was considered and existing provincial legislation was also examined. The prevention of adulteration is a provincial subject and any further legislation would also be provincial. The principal need however, is not an addition to existing legislation so much as better administration of the law.

It is now proposed to draw up a code of instructions which may serve as a guide in both provinces and states. The drafting of this code will be taken up as early as possible and, when completed, a small expert sub-committee will scrutinise the provisions before commending them for adoption by local authorities. It is hoped that, in their own interests, the authorities concerned will be willing to adopt the code for local application.

(*ix*) *Village economic enquiry on the production and consumption of milk.*—His Excellency the Viceroy's keen and abiding interest in the improvement of village conditions and the welfare of cattle led to the Council undertaking a village enquiry regarding the production and consumption of milk.—a scheme which had for its object the collection and collation of information regarding:—

> the number of animals maintained; the amount of milk and dairy products obtained; and the manner of their disposal.

It was decided that the inquiry should be undertaken in villages of certain typical areas where a definite breed of cattle predominated and a certain amount of milk was produced. The areas selected for the purpose were as follows:—

(1) The Hariana Tract, *i.e.*, the Delhi Gurgaon-Rohtak area,

(2) The Montgomery Area in the Punjab where Sahiwal Cattle are bred,

(3) The Kosi Tract in the United Provinces, comprising Muttra and its adjoining area,

(4) The Kankrej Area in the Bombay Presidency,

(5) The Ongole Tract in Madras,

(6) An area in the Central Provinces and Berar where there are a regular crop production and a certain amount of milk production, and

(7) A suitable alluvial tract in Bihar.

The questionnaire called for information in regard to:—(*a*) the number of cows, buffaloes, other working animals and goats maintained in each homestead; (*b*) the production and consumption of milk, butter, ghee, and other milk products, and (*c*) proportionate relationship between the production of milk and milk products and the amounts consumed by the family and otherwise disposed of.

In order that the results of the investigation might be of statistical significance the villages within each tract were selected at random. Defined areas were placed in the charge of supervisors selected from the staffs of the provincial agricultural or veterinary departments and ten investigators were allocated to each supervisor. The supervisors were given a fortnight's practical training by the officers of the Council in a typical village in the Delhi Province. During this period the supervisors themselves collected the information called for by the questionnaire and the material so obtained was scrutinized daily on the spot in order that any errors in procedure might quickly be detected and rectified.

The enquiry is now complete, the data collected are under compilation and will be published as soon as possible. It is hoped that the results will reveal the actual position regarding the production and consumption of milk by cultivators in these typical breeding tracts and provide an economic background for the working out of a sound general policy for the improvement of cattle in India.

(*x*) *Control of disease among livestock.*—The draft Bill for the control of diseases among livestock and the draft rules proposed to be made thereunder, to which a reference was made in the previous report, were circulated for opinion to provincial governments. The drafts have since been revised in the light of the opinions and suggestions received. Draft rules in relation to certain diseases, not previously included in the schedule attached to the original draft, are at present under preparation for inclusion in the schedule. It is also proposed to amplify the draft rules by adding thereto certain provisions regarding quarantine. The draft, in its final form, will be examined by a special committee of the Imperial Council of Agricultural Research.

(*xi*) *Central Veterinary College.*—There is at present no provision in India for a full professional training in veterinary science and Indian students have to obtain such training in other countries. The Royal Commission on Agriculture in India recommended that two entirely distinct courses of study should be framed, one of which would qualify for admission to the higher and the other the subordinate branches of the veterinary services. It was suggested that, at the outside, one of the existing veterinary colleges should be utilized for the training of veterinary surgeons to fill superior posts in all provinces. While the above suggestions were generally acceptable to the Provinces the majority of them made it clear that it would be impossible to give any guarantee regarding the number of superior posts which would be filled annually as the expansion of the provincial veterinary services was limited by financial conditions. The Government of India were also unable for similar reasons to make any progress in the matter.

As a preliminary, however, it was decided that an attempt should be made to secure a better class of students by raising the standard of education for admission to all existing veterinary colleges and gradually to

improve and expand the courses of training at these colleges. With this object in view an endeavour was made to remodel the curricula of the existing veterinary colleges on a uniform basis.

This attempt has met with little success, however, and the position appears to be that (1) the provinces are unable to pay their subordinate veterinary services at rates calculated to attract young men better educated than at present, and (2) a material change in the present curricula in the provincial veterinary colleges so as to bring the courses of training up to the M. R. C. V. S. standard is unlikely. In the meanwhile, the supply of young Indians who have obtained the M. R. C. V. S. qualification by study in the United Kingdom has decreased in recent years and it has been found increasingly difficult to obtain qualified men to fill existing vacancies.

In short, it became clear that little progress would be made until one fully equipped and properly staffed Veterinary College was established somewhere in India where training up to the highest standard in veterinary science could be provided. The Imperial Council of Agricultural Research drew up a scheme, the main feature of which was a proposal to establish such a central college in India.

These proposals were examined by a sub-committee of the Animal Husbandry Wing and it was felt that, for the scheme to achieve any measure of success, it must meet the requirements both of the Defence Department, whose annual requirements of higher grade Veterinary officers are considerable, and of Provincial Governments. The relationship between the Central Veterinary College, and the existing Provincial Veterinary Colleges, which are merely concerned with the training of candidates for the subordinate veterinary services, would also require careful consideration and adjustment.

The conclusions reached were:—(1) that a five years' course of instruction, teaching up to the highest standard of veterinary education, (*i.e.*, to a standard fully equal to that of the M. R. C. V. S. in the United Kingdom), was necessary, (2) that a Central College should be established for the purpose; and (3) that, in view of the various facilities available there, the new college should be located at Izatnagar. A suitable curriculum was drawn up and the conditions under which students of provincial colleges could be admitted to the Central College were discussed and settled. It was considered most desirable to obtain for the Central College suitable recognition by the Royal College of Veterinary Surgeons. The recommendations of the sub-committee were accepted by the Animal Husbandry Wing and they are now under consideration.

(*xii*) *The Sixth World Poultry Congress, 1936.*—The Council arranged for a delegation consisting of Mr. D. P. Johnstone, Assistant Director of Agriculture, Punjab, and Mr. G. D. Bhalerao, Helminthologist, Imperial Veterinary Research Institute, Muktesar, who were both on leave in the United Kingdom at the time, to represent India in the Sixth World Poultry Congress held in Leipzig and Berlin in 1936. Their report shows that opportunity was taken to get into touch with those interested in all phases of poultry work, to stimulate friendly international relations and to study the latest methods adopted in various parts of the world in regard to breeding. The tours arranged for the delegates formed an interesting and instructive feature of the Congress.

(*xiii*) *Inspection of Meat.*—The present system of inspection of meat in India leaves very much to be desired. The attention of the Council was focussed on the problem and a sub-committee of its Dairy Legislation Committee drew up a draft set of model rules to apply to slaughter-houses generally. These have been circulated to provinces (including Chief Commissioners' provinces) and constituent states for eliciting opinion thereon. The rules will, if necessary, be revised in the light of the opinions received and, as finally adopted, will be commended to the authorities concerned for adoption by them or by local bodies under them.

(*xiv*) *Reconstitution of Standing Committees.*—On the expiry of the normal tenure, the Animal Nutrition, Cattle-breeding and Dairying Committees were reconstituted during the year as shown in Appendix II.

(*xv*) *Animal Husbandry Bureau.*—Much useful work was done by the Bureau during the period under review in the matter of collection, collation and dissemination of information on Animal Husbandry subjects, thereby justifying the step recently taken in sanctioning its continuance on a quasi-permanent basis for a further period of five years with effect from the 11th April 1937. Some of the comparatively important activities of the Bureau are set out below.

(*a*) *Establishment of Pedigree Herd Books.*—Relevant data for the purpose of defining the breed characteristics of the seven breeds selected for registration are being collected. When complete they will be sifted and put in order for inclusion in a brochure of the type referred to in the previous report and submission to the Advisory Board for consideration. Meanwhile, the system of pedigree registration followed in other countries of the world and the methods followed in certain places in India are being studied with a view to deciding the manner in which such Books should be maintained. Relevant information on this point will find a place in the brochure which is expected to serve as a guide for breeders and other interested in the question.

(*b*) *Materials for Dr. Wright.*—Materials relating to cattle breeding, dairy industry, fodder production, etc., were collected for Dr. Wright who was also furnished with a memorandum dealing with the present position of the dairy industry in India.

(*c*) *Village Milk Production Enquiry.*—Questionnaires and Forms were prepared and training of supervisors undertaken in connection with the enquiry contemplated regarding the condition of cattle and the production and consumption of milk in villages in India. The preliminary work of compilation of the data collected by the Supervisors has been completed and further action is being taken under the supervision of the Bureau.

(*d*) *Viceroy's scheme for the improvement of cattle.*—The technical work pertaining to the scheme was undertaken by the Bureau.

(*e*) *Revision of tables.*—For the sake of uniformity, and in order that they may be more useful the various tables appended to the annual reports of Civil Veterinary Departments of provinces and constituent states were revised. A note on the subject was prepared for submission to the Animal Husbandry Wing meeting at Madras in December 1936.

(*f*) *Photographs.*—Photographs of different breeds of cattle in India and other materials for publication in a special issue of "Agriculture and Livestock in India" were collected.

(*g*) Relevant materials regarding the slaughter of milch cattle in cities were collected and a press note on the subject was prepared.

(*h*) A list of recognised dairies in India was prepared.

(*i*) A list of the recognised cattle dealers in India and of the breeds dealt with by them was compiled for the benefit of intending purchasers.

(*j*) Data regarding the economic aspect of milk production by *Gowalas* have been received from the provinces and their compilation is to be undertaken shortly.

(*k*) A number of records of milk production in India was obtained, and records from Military Dairy Farms will shortly be collected. It is hoped to make "Milk Records" a regular feature of "Agriculture and Livestock in India".

(*xvi*) *Research Schemes—Veterinary, Animal Husbandry and Dairying.* (*a*) *Disease Investigation Officers.*—In order to find ways and means to combat the ruthless decimation of animals, brought about by the many and varied diseases which prevail in this country telling heavily upon its livestock wealth, a scheme for the investigation of the various diseases was initiated by the Council. The scheme was introduced gradually and is at present in operation in all provinces, except Sind and Orissa, and in Hyderabad State. Thus there is practically a chain of research organisations throughout the length and breadth of the country. The main feature of the scheme was the appointment of Disease Investigation Officers, who were expected to form a valuable link between the Imperial Veterinary Research Institute at Muktesar and the provincial institutions where they existed and, where there were no provincial organisations to form a nucleus for research operations in provincial centres.

In the current year, the scheme will have been in operation for 5 years, *i.e.*, for the period of sanction, in five provinces. Sanction to the continuance of the scheme in such provinces till the end of March 1938 has already been accorded, and to the extension of the scheme to the provinces of Sind and Orissa. The Advisory Board have also recommended that the Government of India should be approached for making permanent provision for the officers engaged under this scheme, thereby ensuring a continuity of work and progress in this direction and giving security of tenure to the staff, the absence of which will, it is apprehended, be derogatory to the value and usefulness of the research work at present being done.

A reciprocal interchange of information in Veterinary and Animal Husbandry matters between India and Burma has been arranged.

Valuable information about the prevailing diseases of animals in India has been obtained through the process of systematic investigation by the Disease Investigation officers. Of the diseases dealt with, Rinderpest was by far the most important. The result of inoculation of numerous cattle proved the practical efficacy of the Goat Virus method of prophylaxis and this has now become a routine in most provinces. Other diseases noticed were the following:—

Contagious pleuro-pneumonia of goats, Tuberculosis and Johne's disease, Bovine Surra, Coccidiosis, Bovine Contagious Abortion and Horn cancer in cattle.

The results already obtained so far amply demonstrate the importance of this investigational work to the country as a whole and its value will steadily increase from year to year.

(*b*) *Goat Virus Vaccination in the Central Provinces.*—Under this scheme the intention is to carry on systematic observations and researches on all aspects of goat virus inoculation against Rinderpest. The Advisory Board, at its meeting held in July 1936, recommended that the Statistician, Imperial Council of Agricultural Research, should scrutinize the statistical side of this work, and that further investigation into the treatment of Coccodiosis, which commonly accompanies Rinderpest, by Carbon Tetrachloride, which has been successfully employed in Bihar, should be conducted. The question of charging for the inoculations was discussed and it was decided that, for the present, vaccination for the control of outbreaks should be free, but that in time it might be advisable to charge for all vaccinations except those performed on approved stock. These should be inoculated free of charge in the interest of cattle improvement.

(*c*) *Johne's disease investigation in Mysore.*—This scheme started working about 1½ years back. The annual report for 1935-36 shows that the work consisted of (*i*) Epizootiological (*ii*) Bacteriological and (*iii*) Chemotherapeutical researches and of (*iv*) collection of data relating to the effect of mineral deficiency as a predisposing factor in the artificially infected animals. The Bacteriological work has progressed very well and the Epizootiological survey is to be undertaken as soon as the examination of the comparative value of the allergic tests is completed. A type culture of Johne's bacillus has been obtained from the Lister Institute and is being maintained for comparative study. An attempt has also been made to study the viability of Johne's bacillus in the soil, by contamination with faeces voided by clinically affected animals. Treatment of the experimental animals with 01. chaulmoogra will be undertaken shortly.

(*d*) *Appointment of a Systematic Protozoologist at the Imperial Veterinary Research Institute, Muktesar.*—For carrying out research on the Protozoa, which are known to parasitize domestic animals in India, thereby causing severe losses among valuable stock, the Council decided to appoint a Systematic Protozoologist to work out the bionomics of the various protozoa met with in this country and their intermediate hosts. The scheme has just started and it is hoped that the results of the research will prove to be of great benefit to the country.

(*e*) *Parasitological Research in the Punjab.*—The object of the scheme is to analyse the basal causes of infestation and find suitable treatment for each type of parasite, having regard to the cost of the remedy. Valuable data have already been collected on both the nutritional and helminthological aspects.

(*f*) *Animal Nutrition at Coimbatore.*—The scheme started working in November 1935. The report of work done under the scheme up to the end of the last financial year shows that further experiments were carried out on cows, heifers and bull calves after a period of stabilisation with the usual dairy rations. Important investigations, such as blood calcium estimations, survey of grasses in the Madras Presidency, composting of the Trichinopoly rock phosphate for use as a mineral supplement, determination of biological values of cereal proteins, effect of differential

manuring on the chemical composition of pasture grass and poultry nutrition were undertaken. The result of the research shows that grains of cereal crops grown under differential manurial treatment are influenced by the manurial treatment of the parent crop. Work on the sulphur metabolism of sheep has also been taken up.

(*g*) *Animal Nutrition at Dacca.*—The scheme relating to animal nutrition, as affecting Bengal, was first started in January 1932 and renewed in January 1937 for a further period of five years. Experiments with water hyacinth, Napier grass, Aman paddy straw and linseed cake were conducted. The results of experiments are being published in the Council's journals in the form of separate articles. The future programme of work under the scheme, as chalked out, includes important fields of investigation such as feeding values of three types of paddy straw, analysis of fodders, feeds as far as possible from typical soil belts of Bengal and mineral aspects of fodders, etc.

(*h*) *The composition of milk at the Allahabad Agricultural Institute.*—This scheme began working in July 1936 and is designed to obtain and summarize accurate analyses of milk. The result of this research is expected to be of the greatest value in all fundamental scientific problems concerning milk. It is intended to be a guide for legislation to set standards, regulating the sale of milk in the towns and cities of India and to meet the needs of public health services as well as to protect honest business.

(*i*) *Goat Breeding at Etah.*—The scheme for the improvement of Jumnapari and Baribari goats by Mr. A. E. Slater, Mission Poultry Farm, Etah, U. P., was originally sanctioned for a period of five years, from June 1932. The Governing Body has approved of its extension for a further period of five years to carry out research, *inter alia*, on the following lines:—

(*a*) The rearing of the pedigree male goats to maturity for sale and distribution,

(*b*) Testing of the herd by the Imperial Veterinary Research Institute for Brucella infection, and

(*c*) Experiments in the manufacture of soft cottage cheese from goat's milk.

The report for 1935-36 reveals that considerable improvement in milk yield of the stock maintained in the Farm has been effected and that the cost of production of milk per pound has been steadily reduced. There has been a great demand for goats of this farm from the various provinces, but unfortunately the Jumnapari herd was stricken with disease at the close of 1936 and will take some years to recover.

(*j*) *Research in Warble Flies at the Imperial Veterinary Research Institute, Muktesar.*—The Scheme is designed to carry on intensive research into the life-history and bionomics of warble flies and to find out certain fundamental facts concerning their habits and distribution in India. These flies cause extensive damage to Hides and Skins in this country. Any attempt to deal with this pest must necessarily be preceded by researches into the seasonal prevalence and the life-history of the special Indian species of the fly. The scheme commenced working on the 1st January 1937 and it is hoped that the results which may be obtained will form the basis for an intensive drive against this pest.

(*k*) *Scheme for the development of Fresh Water Fishes in Bengal.*—The scheme is intended to investigate the life-history and biology of fresh-water fishes for consumption. The knowledge of these has a great bearing on the economic aspect of fish culture and will also be of help in the control of Malaria through fishes that feed on mosquito larvae. To make the investigation fruitful from an economic point of view, it is proposed to correlate laboratory methods with those practised by fishermen. A study will also be made of the life-history, development and habits of the common carp, which have been found to breed successfully in fresh water tanks. The scheme has started working only recently and sometime must elapse before definite results are known.

(*l*) *Dairy Technology—Training grant.*—Mention was made in the previous report of the award of a scholarship to Mr. H. C. Varma, a Supervisor in the Imperial Dairy Institute, to study Dairy Technology in the United Kingdom. On the recommendation of the Scottish Milk Marketing Board, Mr. Varma was allowed by the Council to visit important Government Creamery Research Institutes and Factories on the Continent. On the completion of his training Mr. Verma submitted a report detailing the training he received in the various branches of Dairy Technology and instructional visits he made to dairy factories in the United Kingdom and the Continent. He is on the staff of the Dairy Institute at Bangalore and his advice and experience will be available in connection with any technological work that may be introduced in future with a view to improving dairying in this country.

9. *Technology of Vegetable Oils.—Oil Section of the Harcourt Butler Technological Institute, Cawnpore.*—During the year 1935-36, the Oils Section dealt with 42 technical enquiries regarding difficulties in processes and information connected with the industry of oil milling, soap making and manufacture of allied products. In addition to the above, 24 schemes for oil mills, soap factories and boiled oil plants were supplied to persons interested in these industries, for starting new concerns and developing old ones. 152 samples which were received from the provincial departments of Agriculture and Industries and the oil industry as a whole were analysed. In addition to the above, 710 samples of linseed and 185 samples of oils were analysed on behalf of the Agricultural Marketing Adviser to the Government of India and special staff was engaged in connection with the work of Grade Standardisation of Linseed and Linseed Oil.

The following research and experimental work was conducted at the Institute:—

(*i*) Experiments on the extraction of castor oil by means of rectified spirit as solvent;

(*ii*) Experiments on sweating of soaps;

(*iii*) A study on the kinetics of saponification of Mohwa Oil; and

(*iv*) Ground nut crushing experiments conducted to find out the suitability of types of nuts for oil production purposes.

Five nominees of the Council were admitted to the Diploma Course in Vegetable Oil Technology in July 1936. Two short Course Candidates were also admitted in 1936 as nominees of the Council.

The Governing Body has extended the scheme for a period of six months at an additional cost not exceeding Rs. 15,000.

10. *Research Schemes—Agricultural.*—(*i*) *Rice Research.*—The plan and scope of this important group of research schemes most of which started in 1932-33, have been stated in previous reports. Briefly, the object is to fill the lacunae in our knowledge which existed hitherto, to ensure more adequate attention to this important crop, which covers 80 million acres annually, and to secure a better interchange of information and material between workers in the different parts of India. Some of the schemes completed their original periods of sanction and came up for renewal. They were given short extensions with a view to avoiding any break in the continuity of the work pending the report of Sir John Russell.

Orissa rice scheme.—The rice station at Cuttack was hitherto a sub-station under Sabour (Bihar). A grant of about Rs. 70,000 spread over a period of three years has been sanctioned by the Council to enable this station to become the main centre of research work on rice in Orissa. The scheme also provides for two sub-stations, one at Berhampore (till now in Madras) and the other at Jeypore half the expenditure on which will be met by the Maharaja of Jeypore.

A brief statement of the work in progress at the research stations during 1935-36 is given below:—

Madras.—The scheme is in its fourth year. The results of broadcasting *versus* transplanting experiments conducted during the last three years show that a broadcast crop sown at the right moment and well managed gives as good an yield as the transplanted crop; but so long as one cannot foresee weather conditions it is probably better to adopt transplanting which generally gives greater vigour to the crop than a broadcast one. As regards the "Age of Seedlings" experiment the four years' result shows that 30 and 40 days seedlings are the best in all the four years. The evolution of desirable strains in the more important varieties of Ganjam and Vizagapatam Districts continued to engage attention during the year. Hybridisation work for economic purposes as also for the study of inheritance of certain characters has been in progress since the second year. There was a keen demand for the mass selected bulks of *ratnachudi* and *bayyahunda*; 16,600 lbs. of seed was distributed to ryots of the Tekkali Taluk where there was great scarcity for seed, owing to a failure of crops.

The research station has fallen in the new Province of Orissa; but, the Government of Orissa agreed to the station being under the control of the Madras Government until 31st March 1937 in order to maintain continuity of work. The station has been transferred to the administrative control of the Government of Orissa with effect from the 1st April 1937. It may be pointed out here that the Berhampore station had hitherto served both the Ganjam District now transferred to Orissa and Vizagapatam District which remains in Madras. When the continuance of the station as a sub-station of the Orissa scheme was approved by the Advisory Board that body recommended that varieties bred at Berhampore should be made available to the Madras Department of Agriculture equally with Orissa, for testing in Vizagapatam District.

Bengal.—The year was abnormally bad so far as total rainfall and its distribution were concerned. This delayed both sowing of seed and transplanting at the Bankura station and led to the abandoning of certain tests included in the programme of work at the Chinsurah Station. There was no rain in October which affected the crop enormously, and the harvest was subnormal. The varietal tests could not therefore be studied

for comparative purposes with any amount of precision. Some of the varieties which were significantly higher yielders than the local variety went down this year or failed to keep up their performance. Advantage was however taken of the sustained drought to study (*i*) the behaviour to seedlings with different ages under such critical conditions of water supply and (*ii*) the optimum age of seedlings for transplanting as late as September. Complex cultural experiments and improvement in field technique in relation to uniformity trial as well as border effect and method of harvesting are other important features of this scheme. The cultural and varietal experiments were modified in view of the past experience. The isolation of pure lines and selection of proper strains for suitable situation of lands are progressing well. The situation experiment, started in 1934-35 with the object of investigating the order of interactions of varieties and different terraces and the possibilities of combining adjoining terraces in one experiment was continued with four pairs of varieties differing widely in their life period up to flowering. The study of the life period in *Aus* and *Aman* varieties of rice was started at the Chinsurah centre with effect from the 1st August 1935 for a period of twelve months.

Studies in 1934-35 on the correlation of various characters of 19 strains of *Aman* paddy indicate that for a given strain the yield of grain is significantly associated with number of tillers, weight of straw, height of plant, total number of spikelets, length of inflorescence, flag breadth and flowering duration. In comparing the different strains, only tiller number and weight of straw was significantly correlated with yield. The study on *Aus* paddy led to no very precise results as the number of strains were only seven in 1934-35. The study of correlation of the ninteen strains of *Aman* paddies alone was continued in 1935-36 season as the *Aus* crop could not be grown on account of adverse weather conditions. Under hybridisation several crosses have been made to evolve high yielding strains of rice that conform to trade requirements and also to study the inheritance of economic characters. It may be mentioned that attempts are being made to evolve strains with grain character similar to Blue Rose and having the yield character of Latisail, a selected heavy yielding strain of Bengal. Blue Rose being an exotic variety behaves very indifferently when grown under West Bengal conditions, though it is much favoured in foreign market due to its bold and translucent character of grain. From the F2 progeny to be grown during the next season selections will be made of desirable types in order to fix them. The Rice Committee approved the report subject to the following observations:—

With reference to changes in varieties, it was considered that the varieties should not be included in experiments unless they were really worth while testing and not dropped from experiments except for serious reasons and not merely because results of one year were bad. It was considered that the grade of Niciphos should be stated. The general principles were reaffirmed that the analysis of proprietory manures should be given and that manuring should be done on a nitrogen and phosphorus basis.

United Provinces.—Satisfactory progress was maintained at the Nagina Rice Research Station during 1935-36. Mention was made last year of the detailed study of hybrids between the early enclosed *Spathe* type *Sathi* and high quality rices, the object being to combine immunity to

damage by the Rice Bug (*Liptocorisa Varicoonis*), earliness, hardiness and quality. These hybrids, which were in the F5 generation last year, suffered a serious attack by a bacterial disease, although the plants were immune to the rice fly. The work on economic crosses, agronomic trials and growth studies were continued. A Vernalization experiment is in progress at this station. The results so far obtained are not encouraging.

As regards quality, trials have been made of hulling and cooking qualities. Hulling carried out by several different methods showed consistent differences in behaviour for various types of rice. Storage tends to improve hulling qualities, and stored rice also takes less time in cooking than does fresh rice. The cooking period depends on the variety, but is also affected very considerably by the amount of bran on the grain, and is therefore linked up with the method of hulling.

However, the results of the investigations concerning the cromosome counts, their meiotic behaviour and the morphological variations in the chromosomes of a number of diverse varieties, were compiled for publication and the work submitted to be published in the Indian Journal of Agricultural Science.

Burma.—The breeding, genetical and growth studies and the investigations into the effects of different methods of drying and storing on quality and milling and of soil and climatic conditions on the quality of rice were continued. During the season there was an outbreak of False Smut. The total damage was small, but the disease had never occurred except sporadically in previous years. The whole subject is under investigation by the Mycologist. 180 hybrid cultures were studied for breeding work; and two of them have given satisfactory results. Samples of these grains, together with others under study, were submitted to the Burma Chamber of Commerce, and they were considered good and suitable for both Western and Eastern markets. Arrangements were being made to have a commercial milling test carried out and a trial shipment made to Europe. Samples of rice and paddy of these two new cultures were also sent to individual rice milling firms who were interested in them. The layout was approved by the Station before the experiment was commenced: and the Lecturer in Mathematics, University of Rangoon, has very kindly agreed to work up the data.

Bihar and Orissa.—The following definite results have been reported:—

About half a dozen pure-line selections of South Bihar paddies have established their superiority over the existing standard varieties of the tract, giving statistically significant higher yields by about 20 per cent. Some of the selections are much better in quality than the standard varieties. A complete knowledge of the blooming of flowers in paddy under Sabour conditions and its relationship with various classes of paddies has also been gained and the results will be utilized in future hybridization work. Isolation of pure-lines of *Dalua* (Summer) paddies of Orissa has been accomplished. A new type of paddy, which combines such desirable characters as earliness, grain quality (white medium fine) and high yielding capacity, for being grown as *Dalua* or Summer paddy has been evolved. The flowering time of the so-colled "timely fixed" paddy varieties has been altered by exposing them to different periods of artificial light. Existence of a certain period of dormancy in most of these paddy varieties has been established and Chemical treatment of the seed with traces of acetone or chloroform has been shown to break the dormancy period.

It has further been established that most of the *Aman* paddies, when kept under ordinary conditions, maintain their full viability only for about 8-9 months, after which they gradually deteriorate till they loose them absolutely in next 2-3 months. Further experiments have, however, shown that this period of viability could be considerably increased (to several years) by keeping the seeds in some desiccating medium. This result is of great practical importance in plant breeding work, where large number of unit species have to be maintained.

An important problem is the selection of flood and saline resistant varieties, and in this connection it has been observed that pre-treatment of seed with dilute salt solutions enables the paddy to withstand more saline conditions.

The study of quality in rice has led to the interesting result that fat content is an essential factor; in fine varieties the fat content is higher than in coarse varieties, but the protein content is less.

Central Provinces.—The additional data collected from the laboratory and pot culture studies tend to clear up some of the obscure points regarding the manurial requirements of the chief paddy soils of the Central Provinces. Among the investigations in progress special mention may be made of the work connected with the development of a cheap and practical method by which the large supply of bones available in this Province could be treated and turned into valuable fertiliser. Experiments carried out during the year under report prove clearly that the bone product obtained here is capable of increasing the yield of paddy to a very marked extent. Work on the analysis of the rice soils continued broadly on the lines reported in the preceding year—especial attention being paid to ascertaining how the variations in the texture, phosphate, nitrogen and humus contents, exchangeable calcium and carbon-nitrogen ratio of the soils react on the outturn and general quality of the crop.

The microbiological and chemical processes involved in the decomposition of organic and inorganic fertilisers, such as farmyard manure and sulphate of ammonia in two of the typical rice soils (*Matasi* and *Dorsa*) of the Central Provinces have been studied in the laboratory under the usual water-logged conditions of the paddy field. The results have further been compared with those obtained under aerobic soil conditions. The main conclusions are as follows:—

(*i*) The number of the strictly aerobic bacteria in submerged cultures of both the soils, although much lower than those in the aerobic cultures, are sufficiently large to prove the presence of a fairly abundant supply of oxygen in the rice soils during the crop season.

(*ii*) Application of either F. Y. M. or sulphate of ammonia depresses the population (both under aerobic and water-logged conditions) in the heavier soil *Dorsa* while no such effect is noticed in the lighter soil *Matasi*.

(*iii*) Water-logging causes a diminution in ammonia in the lighter soil.

(*iv*) An inverse relationship exists between the bacterial numbers and ammonia accumulation.

(*v*) The accumulation of nitrite is more in the heavier soil than in the lighter one. Nitrate is almost entirely absent in the submerged cultures of either soil.

The work of the Botanical section is devoted to problems mainly of economic importance and aims at obtaining by selection or by hybridization, (*i*) high yielding types suitable for the three main rice growing tracts of the Province, (*ii*) strains which can be easily distinguished from wild rice in the seedling stage and, (*iii*) forms which do not lodge or shed their grain readily. A valuable cross between *Budhia bako* and *Parewa* has now been fixed retaining the quality of the former type together with the characteristic purple auricles of the latter.

The work of isolating unit species from 710 rices under different names was continued and the observations compared with those of the previous year. So far 385 different types have been isolated.

Assam.—The Deep Water Paddy Research Farm at Habiganj was opened in January 1934. A need has been felt for a number of years for special facilities for the detailed study of the long-stemmed *Aman* and *Boro* rices.

Aman grows in a period of abundant water supply where the power to grow and keep pace with the water rise is a necessary adjunct and results in the plant adjusting itself accordingly. *Boro* with a water supply diminishing rapidly with the advance of its season favours the growth of early varieties and those that have a lower total water requirement.

The characters of the spikelet, grain and straw have been studied in somewhat greater detail as on them are dependant some of the important characters of *Aman*.

It has been found that there is a direct relation between the rate of growth and the rate of water rise. When the water rise is rapid, the rate of growth is rapid, when the water rise becomes more or less constant the rate of growth visibly slows down. It has been found that there is an intimate relation between the three factors water rise, nodal rooting and nodal tillering. The result shows that there is a very short dormancy period in *Aman* as germination begins within 20 days from harvest.

The collection and classification of *Boro* paddies are in progress. The different botanical and agricultural characters are being studied. The collection done so far, which is representative of these paddies, do not reveal that amount of diversity of characters as in the case of deep water *Aman*. The qualitative and quantitative characters of the vegetable and reproductive parts are being noted while special attention is being paid to the colour developments of the inner and outer glumes as well as to the size and shape of the grains. The samples collected so far show that *Boro* paddies are on the whole coarse grained. The problem of evolving fine grained *Boro* paddies is engaging attention. An experiment has been laid out during the current season to determine the normal percentage of cross pollination as well as the distance up to which it can take place in *Boro*. Root development in *Boro* paddy have been studied with reference to soil texture ranging from sand to clay.

(*ii*) *Scheme for investigation of the "Gangai" pest of rice in the Central Provinces.*—A two years grant has been sanctioned for an investigation by the Central Provinces, Agricultural Department of the *Gangai* pest of Rice (*Pachy diplosis oryzae*).

Certain recommendations for dealing with the pest have been made, including early sowing, the use of light traps and the use of fertilisers to ensure vigorous plant-growth before the insect appears in August.

Further work, however, is needed on the following points:—

(1) How the insect behaves and how it carries over from crop to crop.
(2) Alternative food plants (wild and cultivated).
(3) The possibility of encouraging the natural parasites of this pest.

(*iii*) *Professor Dastur's scheme of Rice Physiology.*—The final report on this scheme was received during the year. Mention was made in the previous report of a proposal to test on a field scale the reported superiority of a mixture of Sodium Nitrate and Ammonium Sulphate to an equivalent quantity of either fertiliser used alone. With one exception (Travancore State where Ammonium Sulphate proved the better fertiliser) no statistically significant difference between the mixture and its individual ingredients was proved.

The Rice Committee decided that further experiments were not needed.

(*iv*) *Botanical Sub-Station, Karnal.*—Since its inception, the station has been used as far as the wheat work is concerned, for the trial of hybrid wheats bred at Pusa, which were too late in maturity for growth at Pusa, and for yield trials under canal irrigation. It has also served as a base for seed multiplication and distribution to Northern India and Western India and for the training of students. With the transfer of the Agricultural Research Institute to Delhi, the Botanical Sub-Station is being established at Pusa as a station for North-Eastern India.

The yield trials of Pusa 120 and Pusa 165 at various farms in the United Provinces and in the Punjab were continued in 1935-36. In the year under report a new yield trial was laid down to test the new Federation hybrids P. 121, P. 122, P. 125 and P. 126. All these are early, bearded and non-shattering.

The order of merit as regards yield is Pusa 126, Pusa 125, Pusa 121. Pusa 165, Pusa 80—5 and Pusa 122. The differences between the mean yields of the wheats however are not significant except in the case of Pusa 122 which is definitely inferior to the others.

A yield trial of five Pusa and two Lyallpur barleys was repeated for the third year in succession.

It is evident from the results of this year and of the two preceding years that Pusa Type 13 is particularly suitable for Karnal conditions. It may be expected to do well in tracts with conditions of soil and climate similar to those obtaining in Karnal.

Work is also in progress with the object of producing new strains suitable for the eastern Punjab. A number of pure lines have been grown and studied for the last two years and it may be stated that certain of them show definite promise.

A study of the rices of the Punjab and Western United Provinces has been made at this sub-station and 40 pure lines mostly of 60 day rices have been isolated. Field trials are in progress.

(*v*) *Potato Breeding Scheme for Northern India for 1935-36.*—The scheme came into operation on the 1st April 1935.

The main object of the Scheme is the production of new varieties with desirable characters such as immunity or high resistance to blight, and virus diseases, good keeping quality, etc. The attainment of this object involves the study of both Indian and foreign (South and Central American species) material to discover the forms most likely to be of value under

Indian conditions, as parents for crossing. To ensure success in crossing, flowering fertility and sterility, and related problems will have to be also studied. Preliminary trials were conducted with standard set of varieties at Simla, Murree Hills and the Kulu Valley in the Punjab, at Chaubattia (Ranikhet) and Khabrar (Ramgarh) in the United Provinces. and at Shillong in Assam, with a view to obtaining data on the relative amount of flowering and berry formation at these places.

Out of these stations, Simla, was ultimately selected to be the site of the hill sub-station of the scheme for reasons of administrative convenience, and also because of other considerations, *e.g.*, availaability of electricity for green houses, etc.

A valuable collection of South American species of Solanum has been built up with the aid of the Imperial Bureau of Plant Genetics and research workers in the United States of America and the U. S. S. R. The first year's work naturally consisted in the growing of those exotic species which had been obtained from abroad in the form of both tubers and seed. Considerable success was achieved and a number of crosses were made.

Samples of tubers were sent to the Cold Storage Research Station at Kirkee where by courtesy of Dr. Cheema and his Assistant Dr. Karmarkar, they were stored at different temperatures. The final results of this test of course cannot yet be given, but the indications are that, as expected. rotting in storage is materially reduced at the lower temperatures.

(*vi*) *Potato Research Scheme—Madras.*—The third Annual Report on the scheme for the year 1935-36 was considered by the Advisory Board in January 1937. The Botanical Sub-Committee raised the question whether some attempt should not be made to link this scheme with the main potato breeding scheme for Northern India. It was agreed that this point should be given serious consideration if there were any question of renewal.

(*vii*) *Agricultural Meteorology.*—Work under this scheme has however been steadily progressing. As recommended by the Advisory Board in February 1936, a detailed report for the year ended August 1935 was received and circulated to the Advisory Board during the year. In July 1936, the Advisory Board again considered the progress made under the scheme and made certain recommendations especially regarding the usefulness of close collaboration between the statistical and agricultural interests.

In pursuance of a recommendation made by the Advisory Board in February 1936, the Central Government have under consideration the question of placing research work in Agricultural meteorology on a permanent basis. The Governing Body have decided that, should that proposal materialise the Research Council should make an annual contribution in order to maintain contact with this important aspect of agricultural research work. Meanwhile a temporary extension of the present scheme until March 1938 has been sanctioned to allow time for a decision on the question of placing the section on a permanent footing.

(*viii*) *Scheme for the investigation of cereal rusts.*—In April 1930 a grant was made for a period of three years to enable the work which Dr. K. C. Mehta started in 1923 on the rusts of wheat and barley to be developed. In 1933 the scheme was continued for two years and in 1935 a further three-year renewal on a new research programme was sanctioned.

During the year under report work on "Cereal Rusts" was extended in the following directions:—

(1) Survey of Rusts was carried out by 3 local assistants under the immediate supervision of the Professor of Botany, Agricultural College, Lyallpur, Plant Pathologist to the Government of Bombay and the Mycologist to the Madras Government. In addition, the Imperial Mycologist, Pusa, very kindly lent the services of one of his assistants for the survey of rusts at the foot of the Nepal range during the winter of 1935-36.

(2) Wind trajectories were prepared for 16 stations for the year 1933-34, 17 stations for the year 1934-35 and 6 stations for the year 1935-36. Trajectories for 12 more stations for the year 1935-36 are under preparation.

(3) A number of Indian wheats from Pusa, Punjab and Bharatpur were tested for seedling resistance with three races of yellow, three of brown and six of black rust of wheat respectively. Fifteen varieties of wheat both indigenous and foreign were supplied by the Second Economic Botanist, Pusa, for adult resistance trials. These tests were conducted in a green house at Agra specially constructed for the purpose. A number or foreign wheats and F1 crosses were also tested for seedling resistance with the physiologic races of all the three rusts.

(4) A morphological study of the leaf of *Berberis vulgaris*, Linn. and five of the indigenous species of *Berberis* was also started.

These investigations have led to some interesting results. It has been established that yellow rust is capable of over-summering in the hills—at high elevations only—in the form of uredospores on self-sown wheat and barley. Brown and black rusts (the former occurs on wheat only) can oversummer in a similar manner at still lower altitudes and correspondingly higher summer temperatures.

All the evidence relating to first date of rust appearance in the plains to wind trajectories and to exposure of aeroscopic slides, supports the view that infection takes place every year by spores carried by the wind from the hills to the plains. A large number of wind trajectories have been prepared and data regarding the dissemination of rusts to different parts of the country will shortly be furnished.

(*ix*) *Scheme for breeding rust resistant wheats.*—The knowledge obtained under the cereal rust scheme made it evident that it was now possible to start a scheme of breeding rust resistant wheats. The Imperial Council of Agricultural Research have therefore financed a scheme of wheat breeding which is being carried out by the Imperial Department of Agriculture in collaboration with Dr. Mehta. Dr. Pal, Second Economic Botanist, is in charge of this work which was started in April 1935 at Simla and at Pusa.

A large number of crosses have been made between the best Indian wheats and exotic parents of rust resistant properties. During the present year some F1 crosses have been tested with the various forms of black, brown and yellow rust. Thirty-one varieties of indigenous and foreign wheats were also tested with black and brown rust.

(*x*) *Viceroy's visit to the Research Laboratory, etc.*—His Excellency the Viceroy visited the Rust Research Laboratory and Patato Breeding Sub-Station at Flowerdale, Simla East, on Saturday, the 20th June 1936, Dr. K. C. Mehta showed His Excellency round the green house, where wheat of all varieties from various parts of the country are collected for experiment. His Excellency was also taken round the potato fields, where three hundred varieties have been collected from various parts of the country, and some new species imported from Central America.

At the conclusion of his visit, His Excellency addressing pressmen assembled there, emphasized the great economic value of potato crop which was not grown everywhere in India. It meant a money crop for hill people. Investigations carried out revealed great opportunities, for expansion of cultivation and incidentally the sale of this crop.

There was a tendency everywhere to emphasize what had not been done and forget what had been done. The visits to these laboratories and the study of research work done there would act as a corrective. The Press could do a great deal in the matter, so that confidence of the rural population in the work that is being done might be kept up. By producing improved seeds, cultivators gained enormously and the country benefited. This was amply proved in respect of many crops. There was the standing example of the sugar crop in which rapid strides had been made. The villagers would not readily appreciate these benefits unless they are told. In fact, the average villager did not know how the water which he got for irrigation came and what elaborate and costly irrigation canals and head-works had to be erected to give him a regular supply of water. And he even wondered why he should pay for water at all. Thus the Press could do a great deal in popularizing the work done on the agricultural side.

(*xi*) *Horticultural Research—(a) Meeting of Horticultural Research Workers in India.*—The Council has had under consideration the question of the need for uniformity in the maintenance of cultural and yield records of the fruit trees at the various fruit stations in India aided by the Council. In January 1937 the Advisory Board, recommended that a meeting of all Government Horticulturists, and not only those in charge of schemes aided by the Council, should be held in conjunction with a future meeting of the Advisory Board to discuss:—

(1) the question of records,

(2) the lay-out of horticultural experiments, and

(3) better co-ordination of the horticultural experimental work now in progress.

Arrangements are being made to hold the meeting in September, 1937.

(*b*) *Provincial Horticultural Research Schemes.—Madras.*—The site for the Fruit Research Station was finally acquired and taken over on the 1st March 1935 and the preliminary work of surveying and well-testing was carried on before the actual research may be said to have commenced in the beginning of August when the Superintendent took over charge of the station. The Fruit Research Station at present comprises an area of 50·53 acres and is situated in the village of Anantarajupet, Rajampet Taluk, Cuddapah District.

Among the major problems dealt with are the introduction and trial of almost all the varieties of citrus, mangoes and other fruits of proved merit and acknowledged importance in the fruit trade with a view to find out the most suitable and commercially profitable ones to the region.

The programme of work for 1936-37 includes the following:—

Varietal trials.—The collection and planting of indigenous and exotic varieties of potential value of mango, citrus and other miscellaneous fruits.

Propagation.—(1) The propagation of mangoes and citrus to provide the required plant material for varietal trials and various field experiments from individual trees of merit isolated from local gardens.

(2) Study of various methods of propagation in citrus and mangoes with special reference to (*a*) the relative merits of various methods of vegetative propagation, (*b*) the season to perform the operations, (*c*) the method of restricting variability in seedling rootstocks, (*d*) the possibility of restricting the period between sowing and planting stage.

Bombay.—Cold storage of fruit.—A brief account of certain preliminary results arrived at during the 1935 season was given in the last Annual Report. The following is a summary of the more detailed report for 1935 which was received and discussed by the Fruits Sub-Committee in January 1937:—

The following are the main results:—

(*a*) Fully ripe and yellow Nagpur oranges can be kept in good condition for 3 months at 40°F. without any appreciable wastage.

(*b*) The suitable range of temperatures for storing Alphonso mango is between 45°F. and 48°F.

(*c*) In addition to the Alphonso variety the following varieties give promise of good keeping quality in cold storage:—

Peter from the Madras Presidency.

Fazri Zafrani from the United Provinces.

Pyree from the Bombay Presidency.

Cawasjee Patel from the Bombay Presidency.

Fernandez from the Bombay Presidency.

(*d*) The Alphonso mango grown under different climatic and soil conditions does not show any appreciable difference in its behaviour in the cold chambers.

The Report for 1936 season is awaited.

Gas storage of fruits and vegetables.—A scheme for gas storage of fruits and vegetables was considered by the Advisory Board of the Council in July 1936. The Board considered it essential to send an officer to Cambridge for necessary training in the technique of gas storage before the scheme could be put into operation and Dr. D. V. Karmarkar, who was already working on the main cold storage scheme, was selected. He sailed for England in October 1936 and his report is awaited.

While on deputation, Dr. Karmarkar was also to make a thorough study in regard to the construction of cold storage vans, in England and on the Continent.

Bengal (Krishnagar).—This station has been carrying out experiments on the growing of citrus, pineapple, papaya, *phalsa*, tomato, banana and mango. As the work seemed to require improvement the Agricultural Expert to the Council visited the station and made suggestions affecting water supply, lay-out, nursery work, and general cultivation. These recommendations are being acted upon by the Bengal Department of Agriculture.

United Provinces.—The scheme as finally approved in 1932 provided for a station in the hills for research on temperate fruits. The station is situated at Chaubattia in Kumaon where an old Government orchard has provided the nucleus. The programme of work includes the usual horticultural problems of propagation, stock pruning, etc., and also the study of orchard soils particularly with reference to the incidence of pests and diseases. A series of apple stocks obtained from East Malling has been under test and the two aphis-resistant stocks Merton 779 and Merton 793 have proved to be vigorous growers and have maintained their resistance to woolly aphis. Several other Malling stocks would have been very valuable but for their partial susceptibility to the pest. Experiments are being conducted with apples, peaches and pears and the testing of varieties both of stocks and scions forms an important feature of the scheme.

The entomological work for 1935-36 has been largely directed towards filling in gaps in the knowledge of the life history of the apple-root borer, *Lophosternus hugelii*. This pest causes considerable loss of vigour and increased liability to fungal attack, and in many cases the trees are directly killed; work on the best methods of control has been carried out.

Woolly aphis has also been studied, especially the selection of resistant root-stocks, and the correlation of the variability of attack with soil conditions.

The survey and investigation of diseases of deciduous fruits was continued. Eight diseases of apple including three storage diseases, seven diseases of pear including two storage diseases and two diseases of peach have been added to the list of diseases occurring in the previous season. Infection experiments have been carried out with *Coniothecium* species and *Corticium salmonicolor* which cause the stem black and pink disease of apple trees respectively.

The chemical, physical and mechanical analysis of the samples collected has been taken up and their reaction, lime requirements, water holding capacity and sticky point are being studied.

Punjab.—Fruits and vegetables preservation scheme.—This was sanctioned by the Council for a period of two years only in the first instance at a cost of Rs. 11,070. It was started with effect from the 8th November 1934 and the first progress report of the work done under it was considered by the Advisory Board of the Council at its meeting in July 1936, along with an application from the Punjab Government for the extension of the scheme for a further period of two years with effect from the 8th November 1936 on which date the original scheme was to terminate. The Council has agreed to contribute a sum of Rs. 5,400 spread over two years in connection with the extension of the scheme. The first annual report of the scheme shows that good progress has been made with the preparation of citrus squashes and cordials. It was found that irrespective of the sugar concentration, preservation with salicylic acid or sulphur dioxide

gave the best results. The recipes for the preparation of various squashes with a uniform acid of about 2·4 per cent. in terms of citric acid have been worked out and the cost of production calculated. Experiments have also been made with the preparation of lime juice cordials and a method of preparing tomato ketchup has been developed and the product has been found to compare favourably with the imported brands of tomato ketchup. The results of the investigation on tomato ketchup have been published as a leaflet No. 77 of the Department of Agriculture. Investigations on the preparation of pear products have been made and canning trials with five varieties of pears carried out. The results showed that in canning William pears preserved in 40 per cent. sugar syrup gave the best result and that the product compared very favourably with the imported article. A fresh variety of this pear is grown on a considerable scale in the Kulu Valley producing fruit of good quality but which is too delicate for transport to consuming centres. Preliminary investigations of cider making with apples have yielded encouraging results but the subject requires much further investigation before a definite opinion as to its possibility on a commercial scale can be given. The drying of apples, the canning and bottling of peas and various experiments on mango products are all at present in a very early stage and work in these directions will be intensified during the coming year.

Scheme for research on citrus stocks and stocks and grape vines.—The scheme was started with effect from 1936. It is proposed to carry out the work on the experimental farm at Montgomery where an area of about 50 acres will be devoted to the trial of citrus stocks and grape vine breeding. The collection of stocks have already been made and planted at Lyallpur. The scheme will be under the supervision and guidance of the Fruit Specialist, Punjab, and the necessary buildings are provided by the Montgomery farm.

Bihar (*Sabour*).—This station is a joint one for work in the plains for the two neighbouring provinces of the United Provinces and Bihar.

During the year research work was concentrated on the more important fruits of the provinces, specially the mango. The work fell into two sections (1) the study of the response of fruit trees to different propagational and cultural methods and environmental conditions and (2) the study of certain special problems connected with the periodicity of bearing in mangoes. The general work on mangoes included top-working, cultural operations with regard to date of planting, seedling stock trials and a study of vegetative growth in clean *v.* grass cultivation. Experiments were carried out with measures designed to affect flowering such as amudging, root pruning, girdling and ringing. Irrigation given after panicles were formed reduced fruit drop and increased the size of the fruit.

The work on *papaya* and *litchis* was also continued.

Central Provinces.—Scheme of research on "Santra" (Mandarin) oranges.—The scheme was started with effect from 1936. The scheme provides for investigation on root stocks, methods of vegetative reproduction, pruning, varietal trials, irrigation and manuring. Pests and disease and grading and packing will also be studied. The Central Provinces Government are providing 15—20 acres land, laboratory accommodation and a certain amount of material. The Horticulturist has been recruited through the Public Service Commission.

Assam.—The scheme was sanctioned in June 1936. It is proposed to establish a small orchard on the southern slopes of the Khasia Hills and a subsidiary station at the Khanapara Farm in the Assam Valley. The scheme is devoted specially to the study of the indigenous citrus of Assam and will be under the control of the Economic Botanist, Assam.

A tentative technical programme was sent to the Council pending the recruitment of an horticulturist and has been scrutinised by the Agricultural Expert.

North-West Frontier Province.—Scheme for improvement of fruit culture and problems of marketing.—Funds to start the scheme are provided in 1937. The scheme will be located in the orchards at the Government farm, Taru Jabba, and provides for experiments in all branches of horticulture and marketing of peach, pear, and plums. The economics of spraying will also be tested. The question as to whether a suitable officer from the province should be selected for training in England in the technique is under consideration.

Baluchistan.—Canning and Fruit Preserving Schemes.—Funds are being provided to start the scheme during 1937. The Horticulturist is being recruited through the Public Service Commission. A small laboratory will be established at Quetta and equipped with the necessary machinery for canning experiments. The first objective will be to discover which of the fruits and vegetables available in commercial quantities in Baluchistan are most suitable for canning.

Mysore.—Mysore possesses certain local and natural facilities favourable for fruit cultivation. A good deal of preliminary work has already been done by the State; but in order to give a fillip to the industry, the Council sanctioned a scheme to carry on work on two items namely, apples and miscellaneous fruit (which includes pineapple). The programme of work includes (1) selection of suitable stocks and studying their influence on different scions (2) introduction of new varieties (3) experiments on the different methods of propagation (4) manurial and cultural trials (5) study of flowering of plants in relation to climatic conditions (6) marketing problems and (7) maintenance of proper crop records. The site for the Research Station has been selected close to the Hesserghatta Reservoir and work is expected to be started in May 1937.

(c) *Scheme for the study of "wither tip" and associated diseases of Citrus.*—In July 1931, a three-year scheme was approved for the investigation of "wither tip" of citrus fruits, under the direction of Dr. H. C. Chaudhri of the Punjab University, Lahore. The scheme was completed in 1935, and a full report was considered by the Advisory Board in July 1936. A brief summary is given below:—

The "wither tip" caused by the fungus *colletotrichum gloeosporiodes*, leads to drying up of the twigs and fall of the fruit. Under the scheme morphological studies of different strains of the parasite were made, and inoculation experiments carried out to compare the resistance of different varieties. Under moist conditions all varieties showed moderate resistance.

Improvement in manuring and aeration were only partly successful in checking the disease, but good control could be obtained by spraying. The most suitable spray of those tried was Bordeaux mixture with ferrous sulphate as a sticker.

Certain other diseases often associated with wither tip were also studied. Chlorosis was shown to be purely physiological and to have no direct connection with the wither tip fungus. High dilutions of ferrous sulphate, injected or sprayed, were found to assist recovery. Sooty moulds and other saprophytic fungi, following scale insects and living on their excretion, often interfere with the photosynthesis of leaves and the ripening of fruit. These also are checked by suitable spray treatment.

(*d*) *Combined scheme for a San José Scale survey in the Punjab and an Entomological survey in the North-West Frontier Province.*—The separate schemes were approved by the Advisory Board in September 1934 and August 1933 respectively. These two schemes, originally proposed seprately, are combined into a two years' joint scheme under the technical control of the Government Entomologist, Punjab. A whole-time officer stationed at Lyallpur will be in charge, and the area will be divided into a number of circles each surveyed by an Assistant Entomologist.

The chief objects as regards the North-West Frontier Province will be:—

(1) A survey of the insect pests of fruit trees with special reference to the San José Scale and its host plants.

(2) The examination and fumigation of live plants entering India at Peshawar and the Kurram Valley.

At present the knowledge of insect pests of this province is meagre and mainly based on specimens submitted to the Imperial Entomologist. The geographical position of the province and the large imports of fruit throrgh the Khyber Pass, make an entomological inspection service very desirable to restrict the entry of pests.

The Punjab Scheme is especially designed to investigate:—

(1) The food plants of the San José Scale in the Punjab.

(2) Present distribution of this pest.

(3) Movement of infested fruit or nursery stock.

(4) The causes of the pest thriving in certain localities but not in others.

(*xii*) *Dry Farming.*—Dry farming research work is now in full swing and annual reports were published for all the five stations for 1935-36. In *Bombay* the two stations are Sholapur and Bijapur which differ very considerably in their soil conditions. Bijapur contains deep black, the medium black and the limy soils all of which have been the subject of careful study. At Sholapur the soils are of two types—medium deep and light shallow. In all these soils the water retaining and delivering power and their recuperative power as regards nitrogen have been studied also penetration of rain water and loss of rain water by surface run-off. The amazing amount of soil which can be lost in fields unprotected against run-off, was clearly demonstrated in one of the Sholapur experiments where a *rabi* jowar plot lost silt to the extent of 115 tons per acre due to one or two days of very heavy rainfall, the total rainfall of the whole year being only 27·75″ Weeds from the most powerful protection against run-off and considerable protection was also obtained by working the surface soil by a special implement called the scooper. Root studies of plants and varieties were made. The composition of the plant at different times was

investigated. Very important were the studies on the water requirements of the jowar plant. The addition of farm yard manure to the medium and deep soils of Sholapur resulted in definite economy in the use of water by the plant. This is an important finding and indicates the value of farm yard manure apart from and in addition to its manurial value. The sugary secretion of the jower plant locally known as 'chikta' on the basis of past observations, appears to be correlated with a simultaneous occurrence of low temperature and low humidity. This theory has been proved correct by the artificial production of 'chikta' through keeping a jowar plant in a specially prepared chamber where low temperature and low humidity were applied. Large scale trials of the Bombay dry farming method as against the cultivators methods resulted in a very much higher yield of grain, *i.e.*, about 40 per cent. more and a slightly less yield of straw. At Bijapur the season was rendered unfavourable by grass hoppers, by the soil fungus *Rhizoctomia* and by Stem borer. The Bombay dry farming method gave about four times the amount of grain got by the cultivators' methods and about three times the straw.

Madras.—Hagari.—Studies of the mechanical composition of the soil, its hygroscopic moisture and its chemical composition were carried out. General studies on soil colloids were also in progress as also a preliminary study of the soil types in the Bellary district and preliminary studies on the effect of soluble salts and lime on evaporation. Root studies of different types of plants were carried out and a certain amount of trials of different types of Setaria, Sorghum, Safflower and gram were carried out. Experiments were also carried out on bunding, on alternate cropping, on the Bombay dry farming method compared with local practice, on cotton spacing and on certain mixtures of crops.

Hyderabad (Deccan).—This is the second year of the Hyderabad dry farming scheme. August was a very rainy month, 14·25″ being received in that month, *i.e.*, nearly 3/4th of the total annual rainfall. Kharif Jower was the subject of spacing trials. The *rabi* season, however, is the important one. Trials were made of different varieties of jowar, cotton, of green manure for jowar and of a six-year rotation. Lysimeters have now been installed for meteorological records which are now being obtained.

Rohtak (Punjab).—This was the first year of the scheme. Cultural experiments were arranged to study—

(*i*) the influence of deep and shallow cultivation on the absorption of rain water by soil,

(*ii*) the effect of surface cultivation after each shower of rain on the water content of soil,

There were also experiments on (*a*) inter-culture of crops, (*b*) testing of implements, and (*c*) the value of bunds for controlling rain water. The effect of farmyard manure on the surface of soil moisture is being studied, manure being added at the rate of 5, 10 and 15 tons per acre against no manure. Rotational series are being studied. Crops and certain Kharif fodders are under test. Certain interesting root studies have been initiated. In the Soil Section, soil survey of a farm is being carried out, also a study of the movement of soil moisture and the determination of soil moisture in the various experiments.

(*xiii*) *Dacca University scheme for mechanical analysis and study of physico-chemical properties of lateritic soils and nutrition of the rice plant.*—The original sanctioned period of this scheme expired in June 1935 and

it has been extended for a period of three years from that date. Work under the scheme continued to make satisfactory progress during 1935-36. The investigations on the physical constants of lateritic and red soils and their relationship to the content and composition of the clay pointed to establish that there is a broad relationship between the amount of clay and the value of most of the soil constants though there are several other factors which modify the single value constants. The applicability of the alkaline permanganate method has been tested in gypseous soils with success.

As regards the problem of nitrogen supply to the rice plant, the previous observations on the fixation of nitrogen in Faridpur and Dacca soils when water-logged and exposed to sun, have been confirmed. A number of paddy soils from different parts of India have been examined with regard to their nitrogen fixing capacities, and the effect of adding lime to water-logged soils have also been studied. Besides, the fixation of nitrogen in paddy soils under dry cultivated conditions has also been under investigation, and it has been observed that on incubating the soils under optimum conditions of temperature and moisture, nitrogen content increased in the beginning but this was soon followed by a loss. The other experiments during the year included the study of the nitrogen fixing organisms in the leaves of the rice plant, water culture experiments on the rice plant and fields experiments with paddy.

The progress report for 1935-36 was examined by the Soil Science Committee in January 1937 and the Committee have made a number of useful suggestions for future work.

(*xiv*) *Scheme for the study of soil problems in Bengal.*—The investigations initiated during the year under report consisted of Laboratory experiments, experiment in the Pot Culture House and Field Tests.

The greater part of the laboratory experiments was directed at making a generalised study of the soil drying processes. The results support the assumption that water is absorbed by the soil and during drying this absorbed water evaporates.

A pot culture experiment on rice plant was started partly with the object of studying the relation between soil moisture and crop yield and partly with the object of seeing how different doses of water applied at different intervals of time influence the growth and ultimately the seed formation of paddy.

The present experiment was designed to find out the minimum water requirements of the soil for aus paddy and where irrigation is possible what should be the interval between the successive periods and also to find out the critical stages in the growth of aus paddy when deficient water causes permanent damage to the crop.

The relation between the soil moisture and crop yield could not be worked out since most of the plants did not form seed. It is therefore proposed to repeat the experiment this year with shorter watering intervals. The experiment is expected to be of great value to the practical agriculturists for whom it is necessary to know the water requirements at various stages of growth so that by manipulating irrigation according to the necessity of the plants they can harvest a good crop with minimum cost.

Soil samples were collected at random from different corners of the Dacca Farm down to 39″ and moisture estimated and this estimation was continued from November till March. It has been found that beyond 21 inches there was practically no loss of moisture. It may be mentioned here that the year under report had very little rainfall and there had been no rainfall at all since October.

Future programme of work includes:—

1. Studies on the evaporation of water from soil from the stand point of absorption and connected physical phenomena.

2. Water requirements of rice plant—sensibility of the plant to the changes of water content of the soil at various stages of growth—relation between soil moisture and crop yield.

3. Studies on the moisture profile down to the water table. (This work has been suggested by the Soil Committee of the Imperial Council of Agricultural Research.)

4. Dynamometer studies on soil texture and tillage.

(xv) Research into properties of Colloid Soil Constituents (Professor J. N. Mukherjee).—The report for 1935-36 was examined by the Advisory Board in January 1937. The work was considered to be very good indeed, as it was clearing up a lot of difficulties in regard to chemical constitution of clays, a matter of fundamental importance in the study of the soil. Sir John Russell who was present at the meeting congratulated Dr. Mukherjee on the success he had obtained in dealing with a very difficult problem.

The main results so far obtained are briefly summarised below. In connection with the theories regarding the toxic effect of aluminium ions it has been shown that contrary to what is commonly believed such ions are stable on the surfaces of colloidal particles of aluminium oxide (sol or gel) at a pH as high as 6·5.

Regarding the electrochemical properties of the soil absorption complex it has been shown that—

(1) the total acidity of such colloidal systems including hydrogen clays depend on (*a*) the concentration of the alkali, (*b*) rate of surface reaction and (*c*) the nature of the cation.

(2) The amounts of acid set free by neutral salts of barium and calcium are greater than the acid neutralised by the hydroxides of these bases at pH 7.

With silicic acid sols the total amount of acid liberated by leaching with the chlorides of these bases is still greater.

(3) The results show that a regular cation effect, which agrees with the lyotrope series, and on irregular cation effect, which does not, have to be postulated. The former is met with in the acid and the latter in alkaline or weakly acid regions. Thus barium is more effective in the acid region than calcium whereas calcium is more effective in the alkaline region.

(4) The factors to be taken into account in the interpretation of the titration curves, *e.g.*, in connection with lime requirements have been investigated. The results show that these colloidal acids cannot be regarded as acids in true solution. They

are definitely heterogeneous in the sense of the phase rule and in the absence of *a priori* knowledge of solubilities of the acid and of the resulting salt, and of the dissociation constants it is not possible to interpret the titration curve in the manner applicable to acids in true solution. Besides the existence of the double layer imparts characteristic properties to the system which explains the regular cation effect in the acid region. On the basis of these results an attempt is being made to explain the theoretical significance of different methods which have been proposed to measure the base saturation capacity, degree of saturation of soil, and lime requirements and to explain in general the electrochemical properties of the soil absorbing complex.

(*xvi*) *Investigation of the Organic Constituents of Soils, 1935-36.*—Before starting any investigation into the nature of the organic constituents of the soil, it was considered desirable to find out a rapid and accurate method for estimating the soil organic matter.

Of the existing rapid wet-combustion methods of Schollenberger (1), Degtjareff (2), Walkley-Black (3), Tiurin (4), the last method was chosen, as at the time the investigation was started, no quicker and at the same time, reliable method was available (the first report of the Organic Carbon Committee of the 3rd International Congress of Soil Science being received after the adoption of the method).

A study of the relation between the organic matter and loss on ignition of soils has led to the conclusion that in the majority of cases the soil organic matter is nearly one-third of the loss on ignition, but pronounced deviations have also been obtained.

Six soils have been extracted with solvents, *e.g.*, ether, alcohol, benzene for a period of, from 15 to 20 days or more of 6 to 8 hours each. The last solvent has been found to be the best while extracting Assam soils.

Dacca and Madras soils have been found to be too poor in soluble matters while Assam soils are comparatively rich.

Attempts to find out the acid value and the saponification-value of the low melting crude waxy material proved futile owing to chlorophyll that is present.

(*xvii*) *Scheme for research at Allahabad on nitrogen loss and nitrogen fixation in soils.*—A grant for three years has been sanctioned for the above scheme, to be carried out under the direction of Professor N. R. Dhar of the University of Allahabad. Work began in 1936.

Previous work in this laboratory has emphasised the importance of the photo-oxidation of ammonia and its salts in tropical soils, and Professor Dhar considers that nitrification is due more to this cause than to the action of bacteria. Other workers have not been able to confirm some of these results and a grant has been made to enable the work at Allahabad to be completed. Light also plays an important rôle in de-nitrification.

The addition of molasses to soil was found to increase its ammonia content considerably, and one aim of the scheme now in progress is to test the effect on nitrogen processes of adding molasses and other carbonaceous substances to the soil.

(*xviii*) *Research on the preparation of cheap synthetic manure from town refuse and other waste materials.*—Systematic experiments were carried out at the Indian Institute of Science, Bangalore, on (1) the decomposition of town refuse in big chambers and under field conditions, and in small jars under laboratory conditions, and (2) the controlled decomposition of a plant material such as Ragi straw, in bottles.

The experiments started in the first season were mainly concerned with the composting of town wastes other than night soil; and the work showed that the hot fermentation method is peculiarly suited for composting such materials in a successful manner.

Dr. C. N. Acharya has made a detailed examination of the applicability of the hot fermentation method to the composting of night soil. The comparative merits of concrete cisterns, trenches, pits and over-ground heaps were tried and the influence of different factors such as the relative proportions of town refuse, soil and night soil; the optimum moisture content; the optimum period of preliminary aerobic fermentation and of succeeding anaerobic storage; and the efficiency of different methods of packing the compost heap were all taken up for detailed study. They have helped in standardising the method so as to produce a manure of good quality and high nitrogen contents.

One important observation that was confirmed repeatedly during the course of the work was the great danger of a considerable part of the nitrogen present in night soil being lost in gaseous form, unless suitable precautions are taken to maintain the optimum C:N ratio (30:1), by a control of the amount of town refuse added. The methods of utilization of night soil practised to this day in several parts of this country (*viz.*, trench system) and in China (liquefying in pits and putting on the land directly) are bound to result in heavy losses of nitrogen. As the value of an organic manure primarily depends on its nitrogen content, the importance of a method which could conserve all the nitrogen present, is evident; and the hot fermentation process, as standardised in this laboratory, has shown itself capable of yielding synthetic manure containing about double the percentage of nitrogen usually contained in composts prepared aerobically; in other words, *it is possible by suitable admixture with soil, to prepare by this process about twice the quantity of manure containing the same amount of organic matter and nitrogen, as is obtainable by the aerobic method.*

(*xix*) *Scheme of research on the effect of various ions on plant growth.*—A two year grant was sanctioned to enable Dr. S. S. Bhatnagar, of Lahore, to extend his work on the effect of various ions on plant growth. Work began in January 1931, but a small additional grant was given later to enable the investigation to continue until May 1934.

Earlier work in this laboratory had been confined to the effect of traces of certain elements in water cultures. Under the grant from the Council these experiments were extended to field conditions, and the influence of about 15 ions was studied on peas, maize, jowar, beans, barley, moth and gram. Experiments in water cultures, sand cultures, and in the field established the preferential acticity of thorium, uranium, cerium, manganese and zinc, and other accelerating influences on plant growth. Certain ions especially lead and silver, showed an adverse effect. The most effective concentrations, and the toxic limits, were determined in all cases.

(*xx*) *Quality in crops*—(*a*) *Rice.*—A scheme on the quality of rice was in progress under Professor Subrahmanian at the Indian Institute of Science, Bangalore. There was full co-operation with the Paddy Specialist, Coimbatore.

Preliminary work has shown that there is no evidence to show that parboiled rice is nutritively superior to raw rice. The colour of parboiled rice may be improved considerably by reducing the time of steeping and shortening the period of parboiling. Judging from the purely nutritive point of view shelled (unpolished) rices—especially from coloured varieties—are the most satisfactory.

The cooking quality of the different samples were studied from time to time by two methods of volume expansion during cooking, developed in the laboratory. Results showed that the cooking quality improved in samples stored in airtight containers and under anaerobic conditions.

In vitro experiments have shown that when rice is cooked to a paste, it does not digest even half as much as when cooked to the usual fluffy consistency. This difference in starch hydrolysis is exhibited even by stored rice when the latter is cooked to a paste and to a loose structure.

An enquiry into the effect of sulphur fumigation on quality of parboiled rice was taken up at the suggestion of the Agricultural Expert to the Imperial Council of Agricultural Research. A number of rice samples, most of them pure strains from Coimbatore, have been analysed for their various constituents such as moisture, fat, ash, protein, crude fibre, carbohydrates, calcium, phosphorus and vitamin B (spruyt) content.

It has been found that the coarser and coloured varieties have thicker bran layers and contain more nitrogen and phosphorus, than the others. Dry cultivated paddy is generally richer than the wet cultivated one. These observations are in general agreement with the histological findings of Coimbatore workers.

The scheme has been extended on its present basis till 1st December 1937.

(*b*) *Barley.*—In the last report a brief reference was made to the results of the shipments of barley made from the United Provinces, Punjab and Bihar and Orissa during 1933-34.

Samples of barleys of the 1935 crops were received by the Institute of Brewing from:—

(*a*) The Department of Agriculture, Bihar and Orissa in collaboration with the Director, Imperial Institute of Agricultural Research through the Secretary, Imperial Council of Agricultural Research, Simla, 40 samples marked 1—20 and 1B—20B.

(*b*) Economic Botanist (Cotton and Rabi Cereals) to Government, United Provinces, Cawnpore, Manurial trials at three places of Barley C251:—Nos. 21 to 44.

(*c*) Director of Agriculture, Punjab. Samples of two types 4 and 5, irrigated and non-irrigated from six stations. Nos. 45 to 56.

(*d*) Director of Agriculture, Peshawar. Two samples of Plumage-Archer:—Nos. 57 and 58 (not financed by the Imperial Council of Agricultural Research).

The samples have been valued and analysed in the same manner as the samples of the 1934 crops.

On the whole, the Valuation Committee were impressed by the potential value of the barleys of the 1935 crop examined as malting material, both for Brewers and Distillers in the United Kingdom.

There are, already, several important breweries who realise the value of Indian barleys, when these are offered in some of the qualities examined this year, and it is perhaps only a question of time before these better types become more generally popular, if they can be offered in commercial quantities.

(*xxi*) *Scheme for the investigation of the chemistry of malting Cholam* (*Sorghum*).—In 1931 the Advisory Board recommended an application from the Government of Madras for a grant for the investigation of malting cholam (*Andropogon Sorghum*). This scheme was subsequently sanctioned and a three-year programme of work was started in 1935.

Previous work carried out in Madras had shown that malted cholam compared favourably with the various malted foods for invalids and infants already on the market, and that the preparation of malted food from cholam offered a promising line of development.

The scheme now in progress aims at evolving a technique which will give a standard product of good quality. Biochemical work is needed on the optimum temperature conditions, control of enzymes, and a study of the changes in carbohydrates, fats and proteins. The fat content of cholam, in particular, is one of the factors which lower the keeping quality of the malted meal. Work is also being carried out on nutrition aspects of the problem, and a technical method of packing, grading and marketing. A report on the first six months' work includes data on steeping and malting. Twenty-five varieties of cholam have been analysed and six selected for their low fat and protein content.

After three months' storage in glass or tin containers acidity begins to develop, and is not checked by close packing or by packing in carbon dioxide.

(*xxii*) *Punjab Scheme for installing a milling and baking laboratory at Lyallpur.*—The scheme provides for the establishment of an experimental plant for milling and baking tests at Lyallpur where the work will have the assistance of the staff of the Agricultural College and also the advice of the expert staff of a large modern flour mill situated in the vicinity. The Imperial Council of Agricultural Research is providing the cost of the equipment and the Punjab Government is providing the staff and buildings. The equipment will be used for testing the quality of wheats bred in the Punjab and will also be available for testing wheats produced in other provinces.

Funds have been allotted and it is hoped that the scheme will start shortly.

(*xxiii*) *Scheme for research on groundnuts in the Madras Presidency.*—Madras is the province with the biggest area under this important crop, and a certain amount of work has already been carried out on yield tests

of varieties, hybridisation, spacing trials, etc. The principal lines on which further work is desired are:

(1) Isolation and maintenance of "pure lines".

(2) Production of pure lines with high yield, high oil content, high shelling percentage, and low free fatty acid content.

(3) Production of varieties with short, intermediate, and long durations.

(4) Evolution of drought and disease resistant varieties.

(5) Hybridisation of *Arachis hypogaea* with other species of *Arachis* with a view to producing desirable new types.

(6) Study of inheritance of economic characters.

(7) Study of climatic, soil, and manurial conditions on yield and oil production.

(8) Studies on the manurial and water requirements, root systems and the various phases of flowering in the existing and new "pure lines".

(*xxiv*) *Schemes for research on oilseeds—Bengal.*—A five-year scheme for work on linseed in Bengal was approved in 1934 and funds have recently been allotted. The essential feature of this scheme is a study of the oil content and agricultural testing of different types. Although Indian linseed already has an advantage over Argentine linseed in oil-content and quality, there is scope for improvement in the oil-content and specially in the uniformity of that character in the varieties commonly grown.

The Council did not consider it necessary to finance further plant-breeding work in this area, as much has already been done on the linseeds of the Indo-Gangetic plain. It is recommended that all the pure types of linseed isolated at Pusa and all the Pusa hybrids should be systematically tested in Bengal both for yield and oil-content and general agricultural behaviour. The improved United Provinces types which are available, should be similarly tested, together with the 85 cultures of Bengal linseed which have already been obtained.

Central Provinces.—A five years grant has recently been sanctioned for work on oilseeds in the Central Provinces, directed towards the improvement of Linseed, Safflower, Til and Niger (*Guizotia abyssinica*). Funds have been allotted in 1936.

Linseed is the principal oil-crop of the province, which produces 45 per cent. of the total Indian output. Work will be carried out on the production of high yielding types and rust resistant strains. Most of the previous research on linseed has been limited to the Indo-Gangetic plain and special studies are required on the linseeds of the black soil areas, with special reference to their root systems and the effect of different manures and rotations.

Work on Til will comprise—

(1) classification of local varieties,

(2) production of high yielding types,

(3) trial of new and exotic varieties,

(4) manurial and cultural experiments, and

(5) study of diseases and pests. Safflower and Niger will be dealt with on similar lines to Linseed and Til.

Punjab.—A five years scheme has recently been sanctioned for research on the *Brassica* oilseeds of the Punjab, notably Toria, Sarson, Mustard, and Taramira. Funds have been allotted during 1936.

It is intended that this work should be done in close collaboration with the Imperial Economic Botanist and with the Economic Botanist for Oilseeds, United Provinces, in order to secure uniformity of classification in this difficult group. Plant-breeding work will be carried out, with special reference to problems of fertility and self-pollination. Among the improvements aimed at will be a higher oil-content and resistance to fungal diseases. Work under canal-irrigated conditions will be carried out.

(*xxv*) *Travancore Scheme on Coconut Root Disease.*—In February 1936 a three-year scheme was approved for an investigation of "root diseases" of coconut and funds have been allotted in 1936. The coconut palm is a very important crop in South India. The disease known as root-disease has been known for about thirty years, but little is known as to its primary cause, and it is not clear whether it is caused by an organism or whether it is purely physiological. Certain fungi formerly suspected of being causative are now considered to be purely secondary, and the disease can only be properly investigated by a long series of carefully controlled experiments conducted on the spot.

As originally suggested, the scheme was for six years, but the Council considered a three-year scheme sufficient to clear up the question as to whether an organism was involved, and consequently what type of staff is required for any further investigation of the disease.

Scheme for the investigation of coconut leaf disease in the Cochin State.—The scheme was considered in the Advisory Board in February 1936 and the Board came to the conclusion that in view of the fact that the scheme for investigation of coconut diseases in Travancore had already been approved, it was unnecessary to establish a separate scheme in Cochin. The Coconut leaf disease could be investigated at the laboratory in the Travancore State and to deal with the increased work the staff under the Travancore scheme would be strengthened by the addition of one assistant and by an increased provision under travelling allowance.

The Governments of Travancore and Cochin have agreed to this suggestion and the two schemes have now been combined.

(*xxvi*) *Scheme for the improvement of the Castor Crop of India.*—Hyderabad possesses about one-half of the total area under this crop in India and thus produces a large proportion of the world's supply of castor. The yield per acre, however, is only about a quarter of that obtained in Ceylon and in Queensland, showing the need for research on this problem.

The research scheme is under the direct supervision of the Economic Botanist to His Exalted Highness the Nizam's Government, and is located at the main Agricultural Experiment Station at Himayat Sagar. Work was started with effect from August 1935.

A large number of Indian varieties of castor are being grown and a study made of their main characteristics. Yield tests are being carried out, and single plant selections grown for detailed study of various

characters, such as early or late flowering, high oil content, etc. Hybridisation work is also in progress, and the influence of climatic, nutritional and cultural factors will also be investigated.

(*xxvii*) *Scheme for research in the cytology of Indian Crops.*—The scheme provides for cytological research on three crops which have been the subject of plant-breeding investigations at the Imperial Agricultural Research Institute and is for three years in the first instance. The staff will consist of one Cytologist with training in Europe and necessary laboratory assistance will be provided by the Imperial Agricultural Research Institute.

(*xxviii*) *Scheme for research on plant physiology (sugarcane and wheat) at the Benares Hindu University.*—The programme originally submitted was considered to be too extensive and in the scheme as revised work will be concentrated on the following points:

Sugarcane.—Growth and sucrose content in relation to absorption of elements, in other words, physiological analysis of fertiliser effects.

The relation between growth and hydrogen ion concentration.

Wheat.—Effect of soil and climatic factors on growth. Soil nitrogen and moisture content in relation to protein content of wheat.

The scheme was started only recently.

(*xxix*) *Scheme for research in plant physiology by Dr. Bosi Sen, Director, Vivekananda Laboratory, Calcutta.*—This scheme was forwarded by the Government of Bengal and provides for research work in the properties of living protoplasm. The investigation will include a systematic study of the effects of the different cations and anions on living protoplasm of hairs with special reference to the effect on the permeability of the plasma membrane and on the viscosity of the sytoplasm. The scheme was started during the year.

(*xxx*) *Scheme for the investigation of an electric method of hygrometry.*—A small grant was made by the Council in 1934 to Professor J. B. Seth, of the Government College, Lahore, for a two-year investigation of an electric method of hygrometry. This work was started from December 1934.

The principle which it was desired to elaborate was the measurement of humidity by charges produced in electrical resistance of a carbon (pencil) line. It was felt that such a method would be valuable for various agricultural purposes, fruit storage, entomological research, and in particular to soil moisture determination.

The work so far done under this grant confirms the increased resistance of a carbon line on a non-conducting surface with increasing humidity, but suggests that the method lends itself to qualitative rather than to absolute measurement of humidity.

11. *Scheme for research on the systematic cultivation of medicinal plants and study of food poisons.*—A five years' grant for research on this subject was sanctioned, and work was commenced in 1935, under the direction of Lt.-Col. R. N. Chopra of the School of Tropical Medicine, Calcutta.

The scheme provides a useful liaison between agriculture and medicine. India imports large quantities of crude drugs and prepared medicines, many of which could be profitably grown and manufactured within the country.

The programme of work provides for:—

(1) A survey, with the aid of a whole time Botanist, of the medicinal plants capable of being grown in India. Existing literature on Indian drugs requires revision.

(2) Chemical analysis of such products, together with tests of their pharmacological and therapeutical action.

(3) Investigations of food and forage poisons, with special reference to cereal poisons leading to diseases of man and animals.

(4) Close co-operation with the Agricultural, Forest, Medical and Veterinary Departments.

The first progress report for the year 1935-36 has been received and was considered to be very satisfactory. Colonel Chopra has since applied for an additional grant of Rs. 13,200 to enable him to bring out a complete illustrated glossary of the Indian indigenous drugs and medicinal plants and for the establishment of a duplicate herbarium of medicinal plants. This has since been approved by the Governing Body in circulation and necessary sanction has issued recently.

12. *Anti-malarial experiments.*—(i) *Pyrethrum cultivation in India.*—The Public Health Commissioner with the Government of India recently brought to the notice of the Imperial Council of Agricultural Research the desirability of investigating a non-arsenical insecticide for use in the anti-malaria campaign and suggested the use of *Pyrethrum*. The cultivation of this plant (a sort of chrysanthemum) has till recently been done entirely in Japan. In the last few years Kenya has been able to grow the plant and to produce material of highly insecticidal value from it. It has been decided that experiments should be carried out in about twenty suitable localities in India with a view to ascertain whether Pyrethrum of high insecticidal value can be economically produced in India. The Director of the Plant Pathological Laboratory of the Ministry of Agriculture and Fisheries has furnished, free of cost, a small quantity of this seed. It is hoped to start the experiments early in 1937-38.

(ii) *Paris Green.*—The 13th Conference of Medical Research Workers held in Calcutta from 2nd to 7th December agreed that there was no evidence that the application of Paris Green as ordinarily used in anti-malarial work was detrimental to rice or to any other crop. As however, the authorities in certain provinces appeared to differ from this opinion it was recommended that the Agricultural Departments of such provinces should carry out properly controlled experiments on scientific lines in order to satisfy all those concerned that the application of Paris Green was harmless under the local conditions obtaining. This was brought to the notice of the Council. The Directors of Agriculture of provinces and constituent States of the Council were addressed for available information regarding the effect of Paris Green on crops. The replies received showed a divergence of opinion and also revealed that not much experimental work had been done. The subject was discussed by the Rice Committee and the Advisory Board. In view of the inconclusive reports on the

subject received from the provinces the Board recommended that an enquiry should be made from the Public Health Commissioner with the Government of India as to what was considered to be the standard quantity of Paris Green to be used in spraying and dusting experiments, and to furnish this information to all research workers engaged on the problem. This information has since been obtained and circulated to officers engaged in these experiments.

13. *Survey of plant breeding materials.*—During the year under report two small committees were appointed—one for cotton and one for rice—to arrange for the collection of information regarding the range of variability in all characters which it is proposed to measure and in this work to include the designing of schedules for acceptance by the Advisory Board and for use throughout India by botanical workers when describing these crops. The personnel of the committees is given below:—

I. *Committee on Cotton—*

1. Mr. J. B. Hutchinson M.A., (Cantab.), Geneticist and Botanist, Institute of Plant Industry, Indore. (Convener).
2. Mr. V. Ramanatha Ayyar, Cotton Specialist, Madras.
3. Rao Saheb G. L. Kottur, Cotton Breeder, Dharwar, Bombay.
4. Dr. Nazir Ahmad, Director, Technological Laboratory, Matunga.

II. *Committee on Rice—*

*1. Mr. K. Ramiah, Paddy Specialist, Madras.
2. Mr. B. S. Kadam, Crop Botanist, Bombay.
3. Dr. B. L. Sethi, Offg. Economic Botanist, (Sugarcane and Paddy) to the Government of the United Provinces.
4. Mr. M. Alam, Paddy Specialist, Rice Research Station, Sabour. (Bihar).
5. Dr. S. K. Mitra, Economic Botanist, Assam.
6. Rao Saheb K. I. Thadani, Director of Agriculture, Sind.
7. Mr. A. M. Thomson, Senior Marketing Officer (Rice).
8. Dr. B. P. Pal, Imperial Economic Botanist, Imperial Agricultural Research Institute, New Delhi. (Co-opted).

The first committee met in Bombay in March 1937, and the second was to meet in May 1937 at the Imperial Agricultural Research Institute, New Delhi. The reports of the committees will fall within the purview of the next Annual Report.

14. *International Grassland Congress, July 1937—Deputation of Mr. L. S. S. Kumar.*—The Fourth International Grassland Congress takes place on July 8th to 23rd, 1937, including tours to Aberystwyth and other centres of grassland research. An official invitation from the English Ministry of Agriculture and Fisheries inviting the Government of India to participate in the Congress was received from the India Office. Provincial Governments were consulted and the following officers are expected to attend on their behalf.

Madras: Mr. J. A. Wilson, Deputy Conservator of Forests.

Bombay: Mr. E. J. Bruen, Livestock Expert.

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* Has since succeeded Mr. Hutchinson at Indore.

United Provinces: Mr. S. H. Howard, Conservator of Forests.

Central Provinces: Mr. E. A. H. Churchill, Principal, Agricultural College, Nagpur.

As, in accordance with the recommendation made by the Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry in India, the Imperial Council of Agricultural Research will shortly set up a Central Grassland Improvements Committee, it has been decided to send to this Congress Prof. L. S. S. Kumar, Economic Botanist, Bombay Presidency, who has done a considerable amount of work on grasses.

15. *Co-operation with the Imperial Bureaux.*—At the request of the Imperial Bureau of Plant Genetics for Herbage Plants, the Imperial Council of Agricultural Research arranged for the supply of certain seed samples of *Lolium* species required by Dr. T. J. Jenkin of the Welsh Plant Breeding Station.

The Imperial Council also arranged to furnish an article on berseem written by Mr. Wynne Sayer, Joint Director, Imperial Agricultural Research Institute, New Delhi, for inclusion in the proposed bulletin on the Production of Seed of Herbage and Forage Crops to be issued by this Bureau.

Some information on the subject of biennial bearing in mangoes in different parts of India was also collected and transmitted to the Imperial Bureau of Fruit Production, East Malling.

16. *Statistical Studies relating to Agriculture.*—A short report of the work done in the Statistical Laboratory, Calcutta, under the I. C. of A. R. scheme for the year 1936-37 is given below:—

(*i*) *Theoretical Researches.*—In many agricultural problems, for example, in the study of new varieties of rice, it is desirable to trace the relationship between different varieties based on observations on more than one character. The D^2-statistic was constructed to give a statistical measure of the magnitude of the divergence in such cases. It is hoped that with the help of this statistic it will be possible to arrange different varieties in some kind of a systematic manner according to the amount of mutual resemblance or divergence. The exact sampling distribution of the D^2-statistic under certain conditions (namely, when the population values of the variances and co-variances for the different characters are the same for different varieties and are supposed to be known) was determined some time ago. Tables of five per cent. and one per cent. values of the D^2-statistic for one to twenty characters based on this distribution were completed this year. The statistic was also used for a first study of a number of varieties of rice cultivated in three situations at Bankura using five characters. On the theoretical side work is proceeding on the moment co-efficients of the D^2-statistic when the sample (instead of population) values of variances and co-variances are used for its calculation, and on the connexion between this statistic and the discriminant recently introduced by R. A. Fisher.

In the theory of sampling distributions a paper was published on the use of a new type of Rectangular Co-ordinates for the evaluation of a large number of exact distributions of variances and co-variances. The distribution of means of samples drawn from Mackay's Bessel function population was shown to follow the same form as that of the parent population. Properties of a particular Bessel function distribution, and the relative

efficiency of various estimates of the regression co-efficient were also studied. A table of one-tenth per cent. values of the ratio of variances was prepared and published.

(*ii*) *Studies in field experiments.*—A great deal of work was done on the applied side in connexion with the analysis and interpretation of results of field experiments. A few topics of general interest may be mentioned here. The method of estimating individual yields in the case of mixed up plots was obtained last year; appropriate standard errors for testing the treatment means including mixed up yields have been now obtained, and it has been shown that the loss of information with two mixed up plots corresponds to the limiting value of half a degree of freedom. A statistical analysis of the yield of the permanent manurials conducted over twenty-two years in Pusa has been published, in which the rates of annual deterioration in soil fertility under the different organic and inorganic fertilisers have been determined. The optimum shape and size of plot for sugarcane experiments was determined from a study of uniformity trial experiments in Bihar and Assam. A preliminary study has also been made of certain data relating to rind hardness in relation to lignification in sugarcane.

(*iii*) *Training in Statistical methods.*—Twenty-three officers came to the Statistical Laboratory, Calcutta, during the year under review for courses of training in statistics with special reference to agriculture. Apart from the general course in analysis of variance, correlational analysis, preparation of designs for field experiments, instruction was given in a large variety of special subjects to suit individual requirements.

(*iv*) *Enquiries.*—About 70 statistical enquiries relating to Agriculture were received during the year from different parts of India, which included analysis of field experiments, scrutiny of experimental schemes and projects and preparation of new designs for experiment. Some of the notes written in this connexion are being published in the form of papers.

(*v*) *Miscellaneous.*—At the invitation of the Bihar Department of Agriculture Prof. P. C. Mahalanobis visited Masheri and Pusa Sugarcane Research Stations in Bihar. Mr. S. S. Bose visited on several occasions the Rice Research Stations in Bengal, and at the request of Director of Agriculture, Assam, visited a large number of the Agricultural Stations of Assam. Mr. S. S. Bose also visited the Tocklai Experimental Station, Assam, at the request of the Indian Tea Association.

17. *Cost of production of crops in India.*—The Enquiry terminated in all provinces and States by or before the end of November 1936, with the exception of Bengal and Bihar where it will continue till June 1937. The data for all the three years from all the provinces (except Bengal and Bihar) have been received and are being compiled and analysed.

A Special Officer was recruited in November last for writing the report. He was mainly occupied with checking the data and drawing up the lines on which the report was to be written for the approval of the Joint Sub-Committee.

A meeting of the Joint Sub-Committee was convened at Bombay on 28th February 1937 to decide certain controversial points regarding 'Rental Value' 'Batai', etc., and also to consider the question of the additional staff required for compilation and their period of employment. Another meeting was called at Delhi on 5th April 1937 to discuss the synopsis of the Report prepared by the Special Officer and the Chief Economist and decide finally the way in which the data should be compiled and presented.

It is hoped that the report of the inquiry will be ready before the end of 1937.

18. *Sugar.*—(*i*) *Sugar Committee.*—The Sugar Committee met at Simla on the 8th-9th July 1936. Sir William Stampe, Kt., C.I.E., Chief Engineer to the Government of the United Provinces, gave an instructive address on hydro-electric developments and the use of underground water supplies in the United Provinces with special reference to sugarcane cultivation. The Sugar Committee considered the views of the Departments of Agriculture in the Provinces and constituent Indian States and of factory owners on the relative advantages and disadvantages of ratooning. This resulted in the appointment of a special Technical Sub-Committee to work out details of an experimental scheme in order to get accurate information as to the effect of ratooning on the incidence of insect pests. There was an important discussion on the recommendations of the Crop Planning Conference regarding extension of sugarcane cultivation, as a result of which it was decided that Local Governments should be asked to consider whether it was wise actively to encourage further increases in the sugarcane areas and whether they should not concentrate on the improvement of the sugarcane quality.

(*ii*) *Funds for sugar research.*—The following grants have been approved by the Governing Body during the course of the year:—

(*a*) Continuation of research on mosaic and other diseases of sugarcane at the Imperial Institute of Agricultural Research, Rs. 41,480 for 2 years.

(*b*) Continuation of the sugarcane research scheme in the Bombay-Deccan. Rs. 1,24,200 for 3 years.

(*c*) Extension of the sugarcane research scheme in Bihar. Rs. 84,500 for 3 years.

(*d*) Research on sugarcane in the Hyderabad State. Rs. 5,000.

(*e*) Research on the utilisation of bagasse for the paper and board industry at the Forest Research Institute. Rs. 15,000.

(*iii*) *Progress reports on sugar schemes.*—As usual, a number of annual progress reports have been received most of which have been examined by the Sugar Committee and some by the Advisory Board as well. The following paragraphs contain a brief statement of the progress of research work under each of the schemes and the results achieved.

Sugarcane Sub-Station at Karnal.—As a result of varietal studies, Co. 421 turned out to be one of the discoveries of the season. Of the already proved varieties Co. 312, Co. 313 and Co. 333 all proved superior to the standard cane of the tract, *viz.*, Co. 285 in one or more characters.

Scheme for sugarcane research in Bihar and Orissa.—In addition to the ordinary varietal studies there has also been a study of varietal resistance to borers.

Sugarcane research in United Provinces at Shahjahanpur and Muzaffarnagar.—A comprehensive programme of work was carried out dealing with agronomic, botanical, varietal, chemical and physiological aspects of sugarcane cultivation. Generally speaking, the limit of profitable application of nitrogen at existing prices appeared to be 100 lbs. per acre. Early planting appeared to be best, the general trend being one of lowering of

sucrose as the season of planting advances. Molasses as a manure significantly increased the yield of crop and its utilisation as a manure is mainly a question of—

(*a*) transport,

(*b*) method of application.

Some thirteen Co. varieties have now been finally selected as the best, and are being thoroughly tested. Chemical investigations have dealt with the utilisation of different kinds and parts of green manure plants in connection with nitrogen fixation and the effects of organic and inorganic manure and the maturity of cane and sucrose content. Physiological investigations studied the inter-relationship of nitrogenous manuring amount of water and date of planting. A progressive increase of yield was observed with increasing numbers of irrigation up to 6 (one irrigation 80,000 gallons per acre).

Scheme for breeding of thick canes in Mysore.—In 1935-36, which is the third year of this scheme, good work was carried on. The year's observation gives an indication of the relative drought resistance of varieties under Mysore conditions. Certain of the Co. and HM. varieties were found to be very good drought resisters. The attack of cane borer has been largely brought under control by a combination of cultivation methods and the use of an insect parasite of the Borer. The use of X-Rays has induced the production artificially of a considerable number of new varieties of cane some of which may be of commercial value.

Scheme for sugarcane research in the Punjab.—Work has been done at the sugarcane research station, Risalewala near Lyallpur and at Jullundur. Varietal, manurial and watering experiments have been carried out, chemical studies made of different kinds and entomological and mycological investigations have also been done.

Sowing in lines 2 feet apart on the flat and in trenches and the crop ridged before the rains compared favourably with the ordinary one-foot-apart sowing on the flat. The 2 feet interval also allows of bullock cultivation. Manurial experiments showed that there was no response to potassic and phosphatic manures. Among varieties Co. 331, 371, 385, 392, 395 and 421 were of good results, the last named being outstanding in tonnage and also in resistance to drought and frost.

Scheme for extension of sugarcane work at Jorhat, Assam.—In 1935-36 experiments were continued on ratoon and plant canes with combined manurial, cultural and varietal experiments. The variety Co. 419 gave a record outturn of 54 tons per acre, the highest ever obtained on the farm. During the year, the station was visited by Mr. R. L. Sethi, Officer on Special Duty (Agriculture) with the Imperial Council of Agricultural Research and Rao Bahadur M. Vaidyanathan, Statistician, Imperial Council of Agricultural Research who gave advice as to the improvement of the work at this station.

Scheme for sugarcane research in the Bombay-Deccan.—The work of the Soil Physics Section has resulted in the classification into nine soil types of the area on the Pravara canals. Soil fertility studies have given useful indications in the evolution of practical measures such as increasing the availability of phosphatic fertilisers and the enhancement of the beneficial effects of fallows and rotations. Further progress has been made on the reclamation of *Chopan* soil (formerly regarded as impossible for sugarcane cultivation). Work under the Crop Physiology Section has shown

that the most critical period in the life of sugarcane is from the middle of May to the end of June and that if the monsoon is late, the normal application of 70" irrigation water is definitely short of crop requirements. On the other hand, 130" is definitely excessive. Sugarcane appears to have an inexhaustible hunger for nitrogen and the optimum dose has not been reached up to 300 lbs. per acre. Investigation is proceeding up to 600 lbs. per acre. In the Agricultural Management Section 95 acre inches appears to be best amount of water. Co. 419, which has proved exceedingly good has been released in the district for planting and multiplication. Co. 290 and Co. 360 are already under distribution. Among the new arrivals Co. 421 and Co. 426 are very promising. This scheme has been renewed under a slightly changed form for a further period of three years.

Scheme for sugarcane research at Dacca.—Continuation of selection work has gone on at this station and 11 varieties from the *promising* group have been transferred this year from the cane station for trial in the *intermediate* block next year.

Scheme for sugarcane research in Madras.—At the sugarcane station at Anakapalle, Madras, there has been a great variety of experimental work including in addition to the usual manurial and varietal experiments, trials of sugarcane on swampy land and also under dry conditions. In this station also molasses has been studied as a manure and has given as good results as groundnut cake. Of varieties, Co. 313, 419, 421, 602, 381 and POJ 2878 are promising. The varieties Co. 243 and 281 gave good yields when ratooned on wet lands.

The study of varieties forms a great part of the work at Gudiyattam in North Arcot and generally speaking Co. 213 has given significantly higher yields than all varieties except Co. 243. Ratoons up to the 3rd year ratoon are being studied in detail particularly in connection with insect attack.

Scheme for sugarcane research in the North West Frontier Province.—Experiments showed the value of silt as a manure. In green manuring, shaftal gave somewhat better results than other green manures. Planting in the first week of March gave the best yields.

Scheme for investigation of mosaic and other sugarcane diseases.—Several experiments were, during the year, spoilt by white ant attack. Some data were obtained regarding the thermal death point of the mosaic virus. It was established that maize and powar plants could be infected by mosaic leaf juice from sugarcane Co. 213. The survey of cane diseases was continued.

Report on the Manufacture of Khandsari Sugar by the open single Pan method at Patna.—This scheme was financed by the Imperial Council of Agricultural Research for a period of three years in 1934 and will come to an end in 1937. The work in 1935-36 dealt with a comparison of different furnaces and data were obtained with regard to various details in juice boiling and *rab* production. The Assistant-in-Charge of the work devised a useful little instrument called Rabometer costing about two annas for determining the brix of *rab*.

(*iv*) *Imperial Institute of Sugar Technology.*—The Sugar Section of the Harcourt Butler Technological Institute has been converted, with effect from the 1st October 1936, into Imperial Institute of Sugar Technology. The estimated cost of the Institute to the Central Government is Rs. 14 lakhs spread over a period of 5 years. The Advisory Board of the Institute

met at Cawnpore on 11th February 1937 and examined *inter alia* the details of the equipment of the Institute and of the syllabuses of teaching. The rules and regulations and the curriculum are now ready and the courses under the new arrangement are to begin on the 10th July 1937.

(*a*) *Industrial and Technical.*—Out of a total of 146 cane factories in India, 137 factories worked during the season 1935-36 as against 130 factories in the previous season. Eight factories did not work during the season and one has been excluded as it is a small experimental factory for training of students with a nominal and uncertain output. 146 cane factories are expected to work during the season 1936-37, out of 150 factories in India. 13 factories refined *gur* during the year 1936 as against 12 factories in 1935.

The position of the sugar industry in India from the technical aspect is shown by an analysis of the average percentage recovery of sugar from cane for factories in different provinces of India during the season 1935-36 compared with that of the previous season.

Average percentage recovery of sugar from cane during the season 1935-36.

Particulars	Average percentage recovery from cane.							
	1935-36				1934-35			
	U. P.	Bihar and Orissa.	All other provinces	All India	U. P.	Bihar and Orissa	All other provinces.	All India
Maximum .	10·60	10·60	11·34	11·34	10·44	9·74	11·10	11·10
Minimum .	7·45	6·60	6·59	6.59	5·45	6·93	5·00	5·00
Mean . .	9·60	8·93	9·00	9·29	8·56	8·79	8·77	8·66

The highest recovery for the season was 11·34 per cent. as against 11·10 per cent. during the previous season. The average recovery for the whole of India shows a very substantial increase, the figure being 9·29 for 1935-36 as against 8·66 for 1934-35.

The work under the Sugar Production Rules, 1935, was continued, but some important changes were made. The first and final forecasts on sugar production in India were prepared on the basis of the returns received under the above Rules. Consolidated Statements of (*i*) manufacturing data, (*ii*) total price paid for cane and the net price received by the grower, and (*iii*) sugar production and stocks were also compiled and issued. With a better realisation of the importance of these statistics, there was a demand for more frequent compilation and publication of statistics, sugar prices and stocks. The consolidated statement of sugar production and stocks is, therefore, now prepared fortnightly and is published regularly in the Indian Trade Journal as is also the consolidated statement of sugar prices so as to secure quicker and wider publicity.

The advice and assistance of the Director of the Institute was freely sought in connection with suitable sites for new factories, specifications of machinery, drawing up of schemes and other technical matters. He inspected a number of sugar factories and made extensive tours in discharge of these duties. The following analysis of the nature of his activities will be found to be interesting:—

1. Number of persons advised regarding sites, etc. . . .	67
(i) Specifications and scheme, drawn up and factory run reports scrutinised.	33
(ii) Technical advice dealing with erection, starting up and extention (including sites)	34
2. Number of factories advised during operation regarding efficiency of working	144
3. Number of replies regarding technical education in India and abroad	39
4. Number of replies to general technical enquiries (excluding the above)	701
5. Number of Sugar factories helped in recruiting their technical staff	26

(*b*) *Research and Experiments.*—Experimental and research work initiated by the sugar section of the H. B. Technological Institute is being continued in the Imperial Institute of Sugar Technology on:—

(*a*) Treatment of sugar factory effluents.

(*b*) Experiments on cane dryage.

(*c*) Manufacture of an insoluble road composition from molasses.

Experimental and research work was also commenced and is now in progress on:—

(*d*) Studies in Butyl Alcohol fermentation.

(*e*) Isolation of strains of non-inverting yeasts for the recovery of sugar from molasses.

(*f*) Different methods of sweetening off filter presses.

(*g*) Experiments on the keeping quality of sugars.

(*h*) The optimum pH for juice settling.

(*i*) Dry liming and milk of lime clarification.

(*j*) Experiments with different dyes for the blueing of sugars.

(*k*) Preservation of cane from deterioration due to dryage.

(*l*) Utilization of molasses in the making of bitumen emulsions.

(*m*) The recovery of the valuable constituents of molasses by treating the same with suitable mixtures of organic solvents.

(*n*) Preliminary examination of the amount of sugars recoverable by the continued dialysis of a sample of molasses and the nature of colloids present in the residue.

(c) *Research and Testing Station for the indigenous system of* Gur *and Sugar manufacture.*—During the year under report the Research Station began testing and research work. Particulars of work done are given below:—

(*a*) The following machinery was tested:—

(*i*) Crushers—

1. I. C. A. R. 11 crusher.
2. I. C. A. R. 11 (Made by Kirloskar Bros.).
3. Vasant crusher (Kirloskar Bros.).
4. Phoenix crusher (Jessop's).

(*ii*) Bels—

5. Poona Bel.
6. Rohilkhand Bel.
7. Delhi Bel for cream jaggery.
8. Jullundur Bel.
9. Bhopal Bel (molasses).
10. Ignition furnace for carbon.

(*iii*) Crystallisers—

11. Revolving crystallisers.
12. Berrys centrifugals.
13. Centrifugal K. 19 (Kirloskar Bros.).

(*b*) The following research work was also undertaken at the Station—

1. Comparative study of storing *rab* in (*i*) kalsies, (*ii*) drums, (*iii*) wooden box, and (*iv*) nands.
2. Designing of a hand or power driven crystalliser.
3. Designing of a bullock driven ball bearing cane mill.
4. Sugar candy manufacture from low grade khandsari sugar using activated carbon.
5. Manufacture of decolorising carbons from paddy husk, bagasse and 'dhak' leaves.
6. Gur making with neutralised juice (lime water) for use in refineries.
7. Keeping quality of syrup from neutralised cane juice.

(*d*) *Bureau of Sugar Standards.*—Revised sets of sugar standards were prepared in accordance with the recommendations of the Advisory Committee of the Bureau of Sugar Standards which include separate standards for Colour and Grain. A pamphlet on 'The Revised Standards for Indian Sugar' was compiled and circulated amongst sugar factories, associations of manufacturers and merchants and the Directors of Industries of different Provinces. With a view to utilising old boxes and bottles, it was also

decided to renew the standard grades at lower prices than the initial prices of standard sets. 44 fresh sets and 28 sets of 1935 renewed into sets of 1936, making a total of 72 sets were sold during the year 1936-37, as against the same number of new sets during 1935-36. As in the previous year, most of the sets were purchased by sugar factories, only a few sets having been purchased by sugar merchants and brokers. Wide publicity was given to the Indian Sugar Standards at the United Provinces Industrial and Agricultural Exhibition, Lucknow, by means of the current sets and charts, graphs and samples of standard grades exhibited in the Sugar Court.

Samples of sugar were called for from sugar factories in India and foreign sugar merchants and reports with regard to the quality of samples received were supplied to the factories concerned. These samples along with those of *gur* and *rab* were exhibited in the Institute Museum. A review of the quality of sugar samples received for 1936-37 is being compiled and will be published in due course.

Arrangements are now in hand for the preparation of standard sets for the year 1937-38.

(*e*) *Cattle feed experiments.*—Six samples of cattle feed were prepared in the different proportions of oil cakes, bagasse screenings and molasses. These were sent for feeding trials to—

1. The Allahabad Agricultural Institute, Naini,
2. The Agricultural Chemist to Government, Punjab, Lyallpur, and
3. The Director, Imperial Institute of Veterinary Research, Muktesar.

From analytical reports received from the Agricultural Chemist to the Government of Punjab, it was observed that the protein content of the feed varies from 16 to 20 per cent. with a starch equivalent value of 69 to 70. Feeding trials are still in progress and the final reports have not yet been received.

The method of preparing cattlefeeds was demonstrated at the Sugar Court in the U. P. Industrial and Agricultural Exhibition, Lucknow. Numerous enquiries are being received from various sugar factories for details of the process and some of them propose to take up large scale experiments.

(*f*) *Statistical.*—Statistical work on sugar production and trade continued during the year under report. As in previous years, notes embodying information of use to the Sugar Industry in India were supplied to the Director General, Commercial Intelligence and Statistics, Calcutta, for publication in the Indian Trade Journal. Brief reviews of the cane crop conditions in different parts of the world were compiled for incorporation in the all-India sugarcane forecasts published by the Director General, Commercial Intelligence and Statistics, Calcutta. Periodical reports, forecasts and notes on the production of sugar in India, were prepared and published in the Indian Trade Journal. The Annual Review of the Sugar industry in India for the year 1935-36 was compiled for publication in the Indian Trade Journal. The Director General, Commercial Intelligence and Statistics, Calcutta, was furnished with brief notes on monthly exports of sugar from Java which were regularly published in the Indian Trade Journal. He was also supplied with weekly quotations for refining and edible *gur* in important markets by telegrams. Figures for stocks of sugar at the major Indian Ports together with the first cost quotations

for Java white sugar and the price quotations for typical Indian factory sugars indicating their maximum and minimum limits in the Cawnpore sugar market were also sent to him every week.

(*g*) *Sugar Cable Service.*—The Sugar Cable Service and the Sugar Postal Service continued to obtain and distribute to members early and reliable crop and market reports regarding sugar in the principal countries of the world. The Indian Sugar Trade Information Service continued to collect and distribute among its subscribers daily quotations and weekly reports for sugar from important Indian sugar markets. These quotations as usual were utilized by the Directors of Industries of Bihar and the U. P. for the fixation of minimum prices of sugarcane in these provinces.

(*h*) *Training in Sugar Technology.*—During the year 1936-37, the number of students from various provinces admitted on the nomination of the Imperial Council of Agricultural Research to the three sugar courses at the H. B. Technological Institute, Cawnpore was as follows:—

	I. C. A. R. Nominations.	Students from the United Provinces.
Sugar Diploma course	10	10
Sugar Analyst course	4	6
Sugar Boilers course	8	8

Of these, five each came from the Punjab and Indian States, three each from Bombay, Bihar and the United Provinces and two from Bengal and one from Sind. The number of students from the United Provinces has been shown for comparison.

(*i*) *Employment Bureau.*—The employment bureau continued its activities as in the previous years and assisted a number of technically qualified persons and passed students of the sugar courses in securing employment in sugar factories.

(*j*) *Publications and Library.*—Thirty notes giving detailed statistical information were published in the Indian Trade Journal and two in 'Agriculture and Livestock in India'. The library of the Institute was freely used by persons interested in the sugar industry. 88 publications were added to the library during the year under report.

(*v*) *Report of the Sugarcane Geneticist.*—Dr. (Miss) E. K. Janaki Ammal, M.A., M.Sc., D.Sc., joined duty as Sugarcane Geneticist at the Imperial Sugarcane-breeding Station at Coimbatore in 1934. Her two reports for 1934-35 and 1935-36 have dealt largely with cyto-genetic work and the study of the chromosomes of various forms of the germs *Saccharum*. These studies have thrown light on the relationship of various types of *Saccharum* and also on the relationship of *Saccharum* and *Sorghum* (Jowar). During the year 1935, Dr. Janaki Ammal spent four months abroad including some time at the John Innes Horticultural Institution in England and also attended two important botanical gatherings, the Imperial Botanical Conference in London and the other the International Botanical Congress at Amsterdam.

19. *Schemes for research on sann-hemp in Madras, Bombay, Bihar and Orissa and Central Provinces.*—A small grant for a period of 3 years has been sanctioned for Madras, Bombay, Bihar and Orissa, and a larger grant for a period of 5 years for Central Provinces.

The general programme of work is the same for all four schemes, subject to variations due to local conditions or to particular recommendations of the Hemp Marketing Officer. The objects are:

(1) To endeavour to increase the yield.
(2) To study the effect of seed rate, variation on time of sowing, manurial treatments, etc.
(3) To endeavour to improve the quality of the fibre by modifications in cultivation, harvesting, retting, washing, drying, etc.

20. *Scheme for Investigation into the Extraction of Flax Fibre in Bengal.*—A five years' scheme has been sanctioned on flax cultivation in Bengal and funds allotted in 1936, for research with particular reference to a new method of extraction (suggested by the Director of the Linen Research Association) which enables the usual process of water retting to be dispensed with.

A breaker and pedal scutcher will be required to carry out small scale work on this method, and to compare it with the normal retting process.

Work is also desirable to find out the optimum stage of naturity for harvesting, and the effects of different periods of storage of the dried straw.

21. *Soil Science.*—(*i*) *Soil Science Committee.*—This Committee met twice during the year in conjunction with the meetings of the Advisory Board, in July 1936, and January 1937, and examined the following progress reports and technical programmes of work:—

(*a*) *1934-35.*—Report on the study of soil problems by the Chemical Assistant appointed on the staff of the Agricultural Chemist, Bengal and the soils portion of the report on the Bombay-Deccan sugarcane research scheme. *1935-36.*—Annual reports on the investigations of organic constituents of Indian soils at the Dacca University, research into the properties of colloid soil constituents by Dr. J. N. Mukherjee, mechanical analysis of lateritic soils and the nutrition of the rice plant at the Dacca University and the final report on the effect of ions on plant growth by Dr. S. S. Bhatnagar.

(*b*) Technical programmes of work on the study of soil problems by the Chemical Assistant appointed on the staff of the Agricultural Chemist, Bengal, for 1935-36, and on the scheme of research into the nitrogen loss and nitrogen fixation in soils by Dr. N. R. Dhar. In addition the Committee considered one proposal for extension of a running scheme and a new scheme from the Government of Bombay (for Sind) for sub-surface investigation work in the Lloyd Barrage area in Sind.

(*ii*) *International Society of Soil Science.*—The Sixth Commission of the International Society of Soil Science (Commission for the application of soil science to land amelioration) will hold a meeting at Zurich (Switzerland) in August 1937. The organising authorities of the Commission extended an invitation to the Government of India to participate in the meeting. Enquiries were made from Provincial Governments and the Government of the United Provinces have intimated that Mr. S. T. H. Munsey, I.S.E., will attend the meeting on their behalf.

22. *Statistical Section.*—The section continued its principal function of assisting agricultural and veterinary research officers in the various provinces and the constituent Indian States in the planning of field and the statistical analysis and interpretation of the results. It is also responsible for the general examination and scrutiny from a statistical standpoint of all schemes financed by the Council. In all cases involving the statistical interpretation of biological data the Statistician is consulted when the detailed technical programmes are framed. The progress reports of the several schemes financed by the Imperial Council of Agricultural Research were examined from the statistical aspect and the results of such examination communicated to the appropriate committees of the Advisory Board.

The Statistician's advice was freely sought by research workers in Agriculture and Animal Husbandry and he or his assistant visited a number of experimental stations to assist in the lay-out of field experiments and other statistical details. References to the Section during the year numbered 85.

The following notes were circulated to agricultural officers in India:—

(*i*) A note on Sampling in Sugarcane Experimental Work.

(*ii*) The replication of a field experiment with the same set of treatments from season to season.

A paper on "Sets of Formulæ to be employed in connection with Experiments on Animal Husbandry" was read at the meeting of the Board of Agriculture and Animal Husbandry, 1936, and a paper entitled "A discussion of Sampling Methods in developmental studies on cotton and the statistical treatment of results" was read at the Cotton Research Workers' Conference, Bombay.

Other publications during the year were:—

(1) Two Statistical Tables based on Fisher's *t* (Mis. Bulletin No. 13, I. C. A. R.).

(2) The ideal size and shape of sugarcane experimental plots (I. J. A. S., June 1936).

(3) The application of statistics to field technique in agriculture (Current Science, January 1936).

Some more statistical tables useful for agricultural experimenters are under preparation.

23. *Locusts.*—(*i*) *Locust Swarm movements.*—Though the last cycle of locust infestation which commenced in 1926 ended in 1931, a few insignificant swarms were still noticeable in parts of India during the years 1932, 1933, 1934 and 1935. In 1936, however, there was a complete absence of reports of swarm movements.

(*ii*) *Locust Survey Work.*—Surveys of various areas in Mekran, and Lasbela, and the Sind-Rajputana desert, for keeping under observation the activities of locusts of the "solitary phase" type, were continued in 1936-37 on the same intensive scale as in the previous year by a staff of Fieldmen posted at various centres.

Since April 1936, the Locust Observation Post at Mahwar was closed and observations in the Rajputana area were confined to three centres only: *viz.*, Nokh, Sardarshahr and Chachro, the work being supervised by an Assistant stationed at Barmer in the Jodhpur State. In the Mekran

area, a new centre was opened at Panjgur under a Fieldman for carrying out locust surveys in the difficult hilly terrain of north Mekran. The work of the various Fieldmen in Mekran was under the supervision of a Survey Assistant posted at Pasni since 1935.

(*iii*) *Ecological Studies.*—Studies on the ecology of the solitary phase of the Desert Locust were continued at Pasni and Ambagh. In addition, various observations in regard to the meteorological and other conditions in connection with the activities of the Desert Locust were also made at the Desert Outposts of Nokh, Chachro and Sardarshahr.

(*iv*) *Locust developments in 1936-37.*—(*a*) *Spring Breeding in 1936.*—The winter rainfall of 1935-36 was in defect in most places in Mekran, the total rainfall at Pasni amounting only to 3·89 inches, as against a normal average of 7 inches, and a fall of 11·50 inches in 1934-35. Locust breeding that followed in the wake of the light rainfall ranged between slight and moderate, both on the coastal "rek" areas and in the interior of Mekran. Green hoppers appeared in March and April and the first adults of the new spring generation in the first week of April.

A small number of hoppers was noticed in the interior of Mekran in the Panjgur area during June and July on wild plants in the midst of a Juari field, and apparently represented the second generation of the season.

An instance of "incipient swarming" was also noted this year in the Kolwa area in February-April, 1936, in a Juari field at Rodkan. A number of black hoppers were reported to have been found in the crop in a fairly crowded condition, and the adults that were produced there were reported to have been pinkish in colour and to have disappeared soon. This case is particularly interesting as the swarming had apparently occurred very early in the season and had presumably been the result of a concentration of locusts of the over-wintered generation that had evidently been derived from the population of the coastal areas.

(*b*) *Occurrence of Summer Migration.*—Though the breeding of locusts at Pasni in spring was not extensive owing to the limited rainfall, it led to a definite rise in the population during April. By the middle of May, however, the locust population at Pasni had definitely decreased, presumably owing to migration out of the area. From the 28th May onwards, however, a sudden and distinct rise in the population rate was perceptible and the locust specimens noticed on the "reks", were all marked by the presence of mauve or pink colour at the base of the wings. It has since been proved by experiment that the development of colour on the hind-wings may be brought about by prolonged exposure to the rays of the sun, as would happen when a locust undergoes a migration flight during day time. A similar rise in the density of population was noticed also about the same time (27th May) at Ambagh in the Lasbela area, and similarly at Gwadar (26th May), and at Ormara. In the Rajputana desert area, very few locusts were noticeable in April and the greater part of May, but by the end of May and the beginning of June, locust specimens generally marked by mauve at the base of the wings were found appearing in gradually increasing numbers. There is little doubt, therefore, that a migration of isolated locusts had occurred at all these places, somewhat of the same character as the incursion of July 1935, though of considerably lower magnitude.

(c) *Summer Breeding of 1936.*—There was but slight summar rainfall in the Ambagh area (1·70 inches) during June-July, and consequently only very light breeding resulted therefrom.

In the Sind-Rajputana area, however, summer rainfall was much heavier. During June-July there was good rainfall all over the desert area and resulted in a fairly general breeding spread over the greater part of the desert area. The new adults of this generation were noticeable during August and September. In the southern areas of the desert, the rainfall received after July was on the whole scanty and was not sufficient to bring about further breeding. On the other hand, very heavy rainfall (10 to 16 inches) occurred in the north-eastern parts of the desert (East Jaisalmer and Bikaner areas) during August, and as a result thereof, very heavy breeding was noticeable in these areas, leading to the appearance of two generations of locusts, the first one becoming adult in September and the second in October-November.

(d) *The Autumn Migration.*—On the cessation of the monsoon on the 19th September, a sudden change set in (lasting till the end of October) in the climatic conditions of the Sind-Rajputana desert areas, resulting in a sharp rise in the soil-surface and atmospheric temperatures accompanied by a rise in the general evaporative power of the atmosphere and a fall in the atmospheric humidity. As these conditions are apparently unfavourable for an insect like the Desert Locust, living on the surface of sandy soils, it may be presumed that it would try to avoid these conditions by rising into the upper air, where apparently its flights would be mainly guided by the direction of the prevailing winds.

At the end of September and the beginning of October, there was a considerable decrease in the population in the southern desert areas, such as Chachro and Barmer, and also in parts of Jaisalmer and Bikaner. At the same time, a considerable increase in population was noticed at Ambagh from the last week of September onwards. Similarly, locust specimens of a recently developed brood, possessing bluish or mauve patches at the base of the wings and carrying red mites on their bodies, were noticed during October, November and December at Pasni, Ormara and Gwadar, thereby confirming the theory of migration of "solitary" locusts from the east to the west in the autumn and winter months.

The adults of the second monsoon generation of 1936, began to appear in October-November and were present in large numbers in East Jaisalmer and West Bikaner. The population was found more or less stationary in the areas where it had been produced, throughout the winter months of December and January, and was evidently over-wintering there. There was also some evidence to show that a certain number had succumbed to the freezing temperatures that prevailed on some days during the winter. In February locusts were found active, and some of them were found fully mature after the fall of good winter rainfall received during January and February 1937. By March, however, very few were to be seen here, and, it is presumed that they had migrated out of these areas.

(e) *Spring Breeding 1936-37.*—Owing to the failure of winter rainfall on the coastal areas of Mekran, during the period from December 1936, to March 1937, breeding has not so far been noticeable in the 'rek' areas this year. The chances of the development of any mass multiplication on the 'rek' areas of Mekran this year would appear, therefore, to be very remote,

unless indeed an incursion into the Indo-Iranian region from the Arabian or African areas should take place in summer.

(*v*) *Study of Old Records.*—(*a*) The mapping of the locust data extracted from various sources for the areas of Baluchistan, Sind, Rajputana and Western India States, for the years 1926 to 1930 was completed and is now under study.

(*b*) Much attention was paid during the year to the study of meteorological factors in correlation with recorded locust data. Indian Daily Weather Reports for the years 1926 to 1936 were examined and all relevant data were marked and extracted. As far as possible, the recorded direction of winds on particular dates at the nearest meteorological recording stations was marked on the maps of locust data for purposes of study.

On the whole, it has been found, in general, that the extent and intensity of breeding of locusts are in direct proportion to the distribution and quantity of rainfall. It is also evident that generally the direction of flights of swarms corresponds to the direction of the prevailing winds.

In regard to the causes that produce migration, the data available would appear to indicate that it is the development of unsuitable conditions of humidity and temperature that impels locusts to desert those places where they had been breeding and multiplying until recently. In their endeavour to get out of the area, they rise into the air and as they would not be able to fly against the prevailing winds, their movements would naturally be guided by the direction of the seasonal winds, and may result in their exodus to a region situated in a different climatic belt.

(*vi*) *Extension of the scheme.*—Proposals are at present under consideration for the transfer of the Locust work to the Government of India. Pending a decision in the matter, the Governing Body has sanctioned the continuance of the scheme under the Imperial Council of Agricultural Research for one year with effect from the 1st April 1937 at an estimated cost of Rs. 78,000.

24. *Locust Research Scheme at Lyallpur.*—The scheme for research into the Biology and Bionomics of the Desert Locust under the supervision of the Entomologist to the Government of the Punjab at Lyallpur was sanctioned for a period of three years from the 1st April 1936. The work is mainly that of writing up the results of research. Some papers have already been published in the Council's magazines and more are under preparation.

25. *Locust Committee.*—The Committee (a list of members is given in Appendix III) at its Eighth meeting, held on the 25th and 26th January 1937, reviewed the research work done by the staff working under (1) the Locust Research Entomologist to the Imperial Council of Agricultural Research and (2) the Entomologist to the Punjab Government and have indicated the lines on which the work in question should proceed during 1937-38.

26. *The Fourth International Locust Conference, Cairo.*—The Fourth International Locust Conference met in April, 1936 at Cairo in response to an invitation by the Egyptian Government to various countries interested in Locust Research, and was attended by 63 delegates representing 25 countries. While in previous conferences invitations had been confined to certain interested countries of the Old World, this time they had been

extended to interested countries of the New World also. The United States of America, Canada, Arabia, Iraq and Iran sent their delegates for the first time. India was represented by Khan Bahadur M. Afzal Hussain, M.A. (Cantab.), I.A.S., Punjab Government Entomologist, who read two papers at the Conference. Two papers, *viz.*, (1) "Migration among the Solitaries", and (2) "The Occurrence of Incipient Swarming in Mekran", were contributed to the Conference by the Locust Research Entomologist, Karachi. The discussions which took place at the Conference are reported to have been of great interest and practical value in regard to Locust Research and Control.

27. *Agricultural Marketing.*—(*i*) *Introduction.*—During the year ending March 31st, 1937, the following additional States co-operated with the Central Marketing Staff in the marketing scheme—Travancore, Indore, Nabha, Bawishi and Mohanpur (Sabar Kantha Agency). Marketing survey work was therefore carried out on the basis of a common programme in all the Provinces and 9 major States and in over 200 smaller States which were dealt with by the Central Staff by means of questionnaires. In the course of the year as well as an officer for coffee marketing, a temporary officer was attached to the Central Marketing Staff to deal specially with cold storage problems.

(*ii*) *Programme of Work.*—Surveys were in the first instance initiated in regard to rice, wheat, linseed, groundnuts, tobacco, fruit, milk, eggs, livestock and hides and skins and also in respect of markets and fairs and co-operative marketing.

At a conference between the Central Marketing Staff and Senior Marketing Officers in the Provinces and States held at Delhi at the end of April 1936 it was agreed that as soon as the completion of the enquiries regarding any of the foregoing commodities permitted, survey work should be commenced on the following new commodities:—

Cereals, etc.	Barley, gram (Chena, cicer arietinum) and maize.
Oilseeds	Coconuts, mustardseed, rapeseed and toria.
Fruits	Mango.
Vegetables	Potato.
Special Crops	Coffee.
Animal Husbandry Products .	Sheep and goats, wool and hair, and ghee and butter.

(*iii*) *Progress of Marketing Surveys.*—The local reports indicated that in most Provinces and major States the main survey work on the first group of commodities had been completed and supplementary information obtained. Work on all the new commodities was started in Bombay, Bengal, Madras, Punjab, United Provinces, Central Provinces, Bihar and Orissa, Sind, Kashmir, Baroda and Patiala. Seven new commodities were under survey in Assam and Pudukottai, 6 in North-West Frontier Province, Mysore, Travancore and Cochin, 5 in Coorg and Hyderabad (Dn.) and 4 in Burma. By the end of the year the all-India report on the marketing of wheat was in print and was published on April 27th, 1937. All the main local reports were received for cattle, rice, tobacco, linseed (except North-West Frontier Province), milk (except Hyderabad) and eggs (except Mysore). The reports are being checked and compiled by the Central Marketing Staff and the all-India reports on cattle, linseed, tobacco and eggs are in an advanced stage of preparation.

(*iv*) *Analysis of Samples.*—In connection with headquarters work on grade standards the physical and chemical analyses of samples of the first group of commodities were completed in the course of the year as follows:—

(*a*) *Wheat.*—1,402 samples were examined at the Punjab Agricultural College, Lyallpur, for their physical characteristic and 300 for protein and gluten content. The protein figures varied from 6·56 to 14·65 per cent. moisture content from 7·34 to 13·73 per cent. the majority being between 9 and 11 per cent. Speaking generally the highest protein content was found in the wheats grown in Bombay, Hyderabad and Central Provinces. The outstanding feature of the physical analysis was the low average impurity content of Punjab wheats and the relatively high admixture of foreign matter contained in the samples drawn from the Central Provinces, Bombay and Rajputana. The information derived from these analyses was found very useful in arriving at a standard contract for white wheat. All the relevant information was incorporated in the wheat report.

(*b*) *Rice and Paddy.*—2,355 samples of rice and paddy were subjected to physical examination by the Rice Research Officers in the different provinces and 765 submitted to cooking tests by the Economic Botanist at Dacca and also at Coimbatore. Results of analyses were awaited from the Rice Research officers in Bengal, Bihar and Orissa, Sind and Mysore.

(*c*) *Linseed.*—724 linseed samples were analysed at the Harcourt Butler Technological Institute, Cawnpore, and found to contain on an average about 8 per cent. refraction. The oil content generally varied with the size of the seed. The results of the analyses were compiled and incorporated in the draft all-India report on linseed and also circulated to certain trade associations and representative millers to form the basis for discussion of an all-India Standard Contract.

(*d*) *Linseed Oil, etc.*—At this Institute also 172 samples of oils including groundnut, linseed (raw and boiled), mustard and til oils were examined. The Director's report indicates that the groundnut oil samples submitted were pure but a considerable number of the other oils were found to be adulterated.

(*e*) *Groundnuts.*—The Oilseeds Specialist to the Government of Madras examined 847 samples for physical characteristics and subjected 351 to chemical analysis. These results also were circulated to interested trade associations and oil-millers to form the basis for discussion of an all-India Standard Contract.

(*f*) *Tobacco.*—596 samples of tobacco leaf were analysed by the Assistant Economic Botanist, Imperial Institute of Agricultural Research, in respect of size, colour, texture, damage, etc. It was found that in most cases the top, bottom and middle leaves were mixed and that diseased leaves were packed along with sound ones. The different coloured leaves were, however, not so badly mixed. It was observed during

storage that lower grades lose their original colour faster than the higher grades. It was found almost impossible to judge the quality of manufactured tobacco sold in powdered form (*e.g.*, bidi and *hooka* tobacco) except by testing the smoking quality. A further set of 67 representative samples of different types of tobacco were chemically analysed at the Imperial Institute of Agricultural Research for nicotine and ash content. The results of the general examination were utilised in drawing up standard grade specifications for Indian cigarette tobaccos which were subsequently given statutory effect in the Grading and Marking (Tobacco) Rules issued under the Agricultural Produce (Grading and Marking) Act, 1937.

(*g*) *Hides and Skins.*—24 test packs, of about 25 pieces of hides each, drawn from different parts of India were submitted to tanning tests by Messrs. Cooper Allen & Co., of Cawnpore. An examination of the finished leather produced in the course of these tests was of assistance in drawing up a standard grade specification for raw hides at a tanners' Conference held in July 1936.

By courtesy of certain large exporters at Calcutta and Karachi an analysis was made from their books of the quality of exported hides and skins on the basis of the trade selection as made on the Hamburg system of classification.

Arrangements were made for the analysis of new commodities at various centres and the number received for examination up to the end of February 1937 was as follows:—

(*i*) *Barley.*—383 samples were sent to the Imperial Agricultural Research Institute, New Delhi, all of which were physically examined. Malting tests on a selected number of samples were subsequently conducted at the Dyer Meakin Brewery, Solon (Simla Hills). At the close of the year, chemical analysis of the samples was in progress.

(*ii*) *Gram.*—449 samples and *maize* 342 samples were received by the Cerealist, Punjab Agricultural College, Lyallpur.

(*iii*) *Rapeseed, Mustardseed and Toria.*—640 samples were sent to the Harcourt Butler Technological Institute, Cawnpore;

(*iv*) *Coffee.*—124 samples of ground and tablet coffee were despatched to the Agricultural Chemist, Mysore, and 181 samples of raw and roasted coffee to Mr. W. W. Mayne, Coffee Research Station, Balehonnur. Arrangements were also made for liquoring and chemical tests to be carried out on a certain number of those samples at the Military Food Laboratory, Kasauli, and on liquoring only at another centre.

(*v*) *Experimental Grading Stations.*—(*a*) *Hides.*—Two experimental grading stations for hides were established in the last week of November—one at Agra and one at Delhi. By the end of March 1937, 22,955 hides had been graded at those centres. The grading of skins was started at Delhi and arrangements were in progress to open another grading station for hides.

(*b*) *Eggs.*—An egg grading machine was obtained on loan through the High Commissioner in London. This was set up on 27th November 1936 at Pabbi in the North-West Frontier Province where the Taru Jaba merchants had indicated their willingness to form an association for the grading and packing of eggs. Another egg grading machine was purchased in the United Kingdom and established at Kottarakara in Travancore where there are large supplies of both hen and duck eggs. The numbers of eggs graded daily at these stations have shown progressive increase and altogether upto the end of March 1937 over 8 lakhs of eggs had been dealt with.

(*c*) *Fruits.*—A fruit grading machine was loaned by a firm in England and after being demonstrated at Lucknow Exhibition was used in establishing a citrus fruit grading station at Nagpur with effect from 12th February 1937. It is proposed that the machine should subsequently be made available for use at other important centres.

Arrangements were also made for grading Nasik grapes. The grading and packing station at Nasik commenced work with effect from 1st March 1937.

(*d*) *Ata.*—A small experiment was commenced in December 1936 at Delhi in the preparation by *chakki* millers of wholemeal *ata* from Sharbati and white Dara wheats. The wheat concerned was cleaned, washed and conditioned before being ground in a small *chakki* (stone mill), and the *ata* subsequently distributed in branded, sealed bags. Over two million tons of wheat are ground annually in those small *chakkis* on behalf of consumers who first have to buy the wheat and spend much time in having it cleaned after a fashion before grinding. The object of the experiment is to devise a method of providing consumers with a good clean product of reliable quality at a reasonable price and eliminate the waste of time and energy which goes on at present.

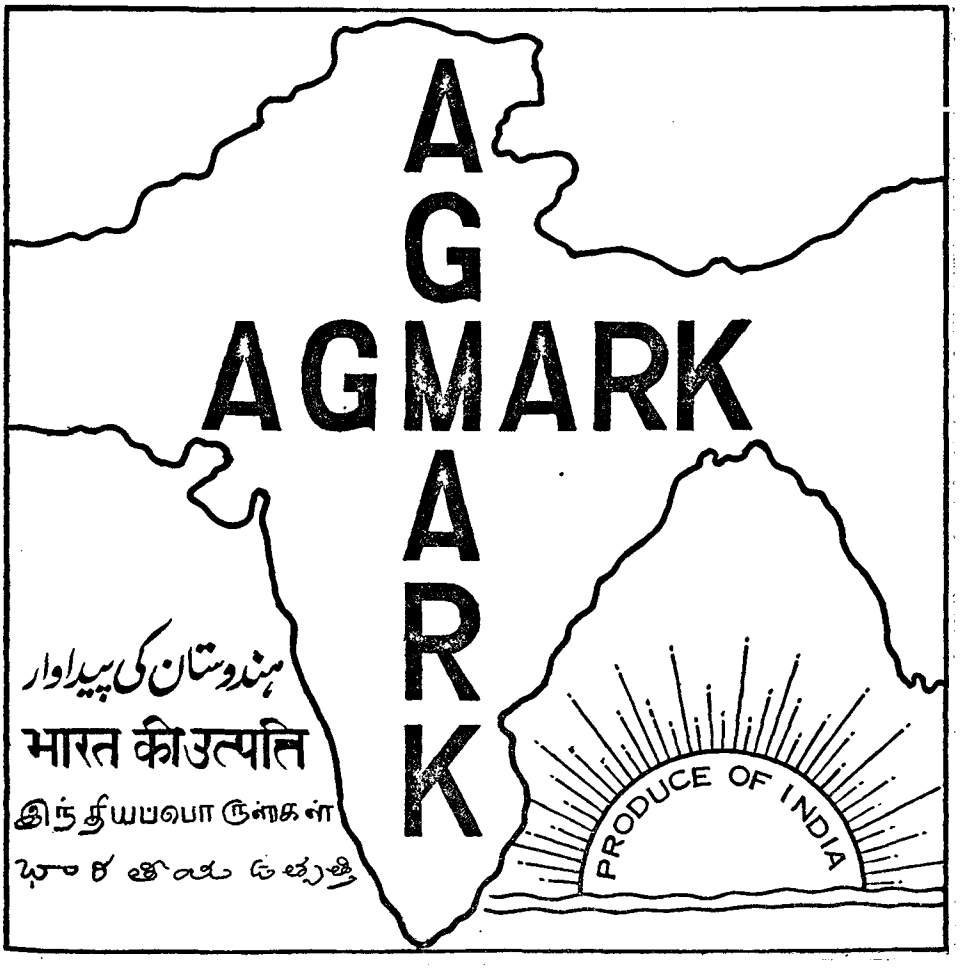
With a view to making adequate arrangements for the establishment and supervision of experimental grading stations and for recording the results of the work, the Imperial Council of Agricultural Research approved of a grant of Rs. 36,000 during 1937-38. The scheme included the appointment of a travelling supervising officer attached to headquarters and recorders at each of the stations.

(*vi*) *Marketing Legislation.*—The system of grading adopted at these experimental stations was based on the commodity analyses and trade discussions already referred to. It was found necessary however in the course of the work to introduce certain slight practical modifications in the grade specifications and to evolve a series of designations and methods of packing and marking by means of labels, discs, seals, etc.

The view was expressed by persons concerned that, even during the period when the grading stations were operating on an experimental basis, there was a grave danger that the grade designations and marks would be copied and otherwise misused. The possibility of protecting the marks under existing legislation was explored in consultation with other departments of the Government of India and it was decided that new legislation would be required. The Agricultural Produce (Grading & Marking) Act, 1937, was passed by the Central Legislature in February 1937.

This Act empowered the Governor-General in Council subject to prior publication to make rules *inter alia* for fixing grade designations, defining the quality and specifying grade designation marks for agricultural produce as set out in the schedule. The products included in the schedule are fruit, vegetables, eggs, dairy produce, tobacco, coffee, hides and skins and the list may be added to from time to time by appropriate notification. Such notifications would only be issued after due consultation with all the interests concerned and after prior publication for eliciting opinion.

The General Rules made under the Act empower the Agricultural Marketing Adviser to issue certificates of authorisation to persons desirous of being authorised to grade and mark their produce, with the prescribed grade designation marks. Special rules prescribing grade designations, definitions of quality, methods of marking and packing, etc , for tobacco, grapes, oranges, eggs, hides and skins were issued. Before the end of the year graded produce bearing the "Agmark" either alone or inset in the map of India (See below) was being packed in accordance with the rules in six provinces and one of the major States.



(*vii*) *Trade Associations.*—As a general policy it is hoped that so far as many of the heavy commodities are concerned, grades and standards will be controlled by suitable trade associations like the East India Cotton Association at Bombay and the Karachi Cotton Association both of which enjoy statutory recognition under provincial legislation. In pursuit of this policy and with a view to encouraging and developing the sense of corporate responsibility for improving marketing methods the Central Marketing Staff, in the course of the year, had many conferences—both formal and informal—with various trade and manufacturing interests concerned in the marketing of different commodities. It is desired to acknowledge the ready spirit of co-operation shown by the large number of associations involved and without which it would have been impossible to make so much progress. The following larger conferences may be mentioned in more detail:—

(*a*) *Grain and Oilseeds Conferences.*—An informal conference of representatives of certain leading Indian grain trade associations and mills was held at Delhi in April 1936, with the object of exploring the possibility of eliminating existing differences between standards and contract terms in the grain markets of India. As a result of the discussion, provisional standard contract terms were agreed on and these were circularised to the various chambers of commerce, associations and other bodies in order to ascertain how far they were prepared to modify the terms of their contracts for wheat in the light of the agreement reached at the Conference. From the replies received, it appeared that most of the changes suggested found favour with the managing committees or boards of directors of a large number of institutions consulted. One association (Amritsar) had already made considerable modifications in its previous contract. In order therefore that arrangements for trading on the basis of a standard contract of all-India currency might be brought into operation as soon as possible, it was arranged that another informal Conference on the same lines should be held at Delhi in April 1937.

It was also arranged that the possibility of eliminating existing differences in tolerances and contract terms obtaining in the various markets in India in respect of linseed and groundnuts should be discussed at the same time with representatives of the seed trade and oilseed crushing industry.

(*b*) *Tanners' Conference.*—An informal meeting with some representatives of the tanning industry was held at Cawnpore in July 1936 to consider contract terms and the existing system of classification of hides and skins with a view to defining suitable grades for raw hides and skins for the internal market. As a result of this meeting, a Federation of Indian Tanners was formed with the following objects:—

(1) to improve and extend the market for Indian tanned goods;

(2) to improve the marketing of hides and skins used in India; and

(3) generally to promote the interests of the Indian tanning industry.

The conference also drew up provisional grade specifications for green hides (kids, buffaloes and calves) and raw sheep and goat skins. These were subsequently introduced at the experimental hide-grading stations already referred to.

(*c*) *Tobacco Conference.*—In October 1936, a conference was held at Guntur of representative producers, merchants and manufacturers when steps were taken to form a tobacco association in time for the 1937 season. It was agreed that the association should draw up standard grade specifications for Indian cigarette tobaccos grown in the Guntur area with a view to trading on the basis of these grades both on the internal market and for export. It was also arranged that samples corresponding with the standard specification would be selected monthly during the course of the harvesting season, beginning in January 1937, and that type samples so selected would be retained by the association and also forwarded to the High Commissioner in London. The association would make arrangements for arbitration in the case of disputes in regard to consignments sold on the basis of the standards and would take steps to disseminate systematic market intelligence regarding prices, supplies, etc. Subsequent to the conference the parties concerned drew up a detailed grade specification for flue-cured and sun-cured Virginia and Natu (country) cigarette tobacco for the Guntur area. Type samples for the first pickings in January and February were despatched to the High Commissioner in London and arrangements made to despatch trial consignments to the United Kingdom of Guntur cigarette tobacco graded and marked in accordance with the Agricultural Produce (Grading and Marking) (Tobacco) Rules, 1937.

(*d*) *Sugar Association.*—The Agricultural Marketing Adviser attended a meeting of the Sugar Mills Association in Calcutta in August 1936, where a resolution was passed to the effect that an all-India sugar association similar to the East India Cotton Association should be established with large statutory powers for the purpose of making forward sales of sugar on the basis of recognised standards. Subsequently along with the Sugar Technologist he had a discussion with the Cawnpore Sugar Merchants' Association on the possibility of institution of organised terminal markets at Cawnpore for Sugar on the lines of the East Indian Cotton Association.

(*e*) *Other Conferences.*—In January 1937, the Agricultural Marketing Adviser had a meeting with the Western Indian Cattle Dealers (Rabaries) Association to discuss certain difficulties in regard to the movement of cattle.

In March 1937, he met the Calcutta Hides and Skins Shippers' Association when it was agreed that the members of the association would instruct their agents to buy on a grade basis (instead of the customary flat rate) hides which were graded and marked in accordance with the statutory rules.

(*viii*) *Cold Storage Work.*—Early in the year the question of cold storage and refrigerated transport was receiving the active consideration of the Army authorities and a joint committee was formed consisting of representatives of the Finance, Defence and I. C. A. R. Departments and of Army Headquarters, the Railway Board, and the Bureau of Industrial Research. It was agreed that the Agricultural Marketing Adviser should act as liaison officer and attend to enquiries from the trade and general public regarding cold storage. An Assistant Marketing Officer with technical qualifications was temporarily attached to the Agricultural Marketing Adviser's staff for this work. In the latter part of the year final arrangements were made by the Army Department for a storage company to be formed (The Indian Cold Storage Company) for the erection of cold storage depots at several places *viz.*, Wana, Manzai, Bannu, Razmak, Mari Indus, Kohat, Thal, Quetta, Peshawar, Nowshera, Rawalpindi, Sialkot, Ferozepur.

Lahore, Jullundur, Multan, and Ambala. The Company concerned also intended to open similar depots, in other places *e.g.*, Meerut, Agra, Muttra, Bareilly, Cawnpore, Delhi, Jhansi and Lucknow. These depots when erected would cater for the requirements of both military and commercial interests and the company proposed, among other things, to demonstrate the possibilities arising from cold storage facilities by trading in perishable commodities so long as the installations were not fully utilised by the trade.

Trials of selected types of modern refrigerated vehicles were arranged to take place at an early date.

The Royal Commission on Agriculture in India drew attention to the need for extending cold storage facilities and the importance of the present enterprise cannot be over-emphasised. The construction of these stores and the introduction of refrigerated transport should prove of considerable benefit in the marketing of perishable agricultural produce. The Special Assistant Marketing Officer above referred to prepared a report on refrigerated storage and transport with particular reference to Delhi province and towards the close of the year was engaged in a survey of ice production and cold storage facilities in the main centres throughout India.

(*ix*) *Market News Service.*—A weekly A. I. R. broadcast was instituted in November, of prices (both 'ready' and 'futures') and of stocks and movements of wheat and linseed in respect of Amritsar, Lyallpur, Karachi, Bombay, Calcutta and Hapur markets. Telegrams are despatched on Saturday evening by the local Grain Trade Associations at those centres to the Central Marketing Staff. A bulletin is compiled from this information and broadcasted on Sunday evening from Delhi. Arrangements were put in hand for including particulars regarding rice and linseed in the bulletin. At the close of the year, the recommendations of the Advisory Board, Imperial Council of Agricultural Research, that steps should, if possible, be taken to pass on to the daily press the weekly market bulletins broadcasted by the Central Marketing Staff from Delhi was receiving attention.

(*x*) *General.*—During the course of the year members of the Central Marketing Staff spent 800 days on tour.

Circumstances permitting, it was hoped that the programme of marketing surveys as arranged at the conference between the Central Marketing Staff and the Senior Marketing Officers of the Provinces and States would be adhered to. It was realised when the scheme originally started that as soon as the first local marketing surveys were completed the extra work would fall on the Central staff in connection with the compilation of the all-India survey reports and also that the development work of an experimental character should begin as early as possible. Practical steps towards improving agricultural marketing by the establishment of experimental grading stations and by the formation of trade associations have been taken rather earlier than was contemplated in the first instance. This interfered to some extent with the time table set for the issue of the marketing survey reports. Further, a great deal of the time of the Central Marketing Officers has been employed in instituting and supervising the experimental grading stations and in conferences with various trade associations. Much of the time of the Junior Marketing Staff was also employed on calculations and similar clerical work and proposals for additional clerical staff have been made to remedy this.

Incidental and development work of a practical or experimental character was not confined to the Central Marketing Staff. All the local marketing staffs were, by force of circumstances, driven to take up some kind of development work incidental to marketing during the year. For example, in Madras the local staff has formed two Fruit Growers' Associations and they were engaged with some success in negotiations with railway companies regarding the reduction of railway freights on plantains, coconuts, betel leaves, etc. In Bombay, the staff have been engaged in negotiations for improving the marketing of grapes, and in the Central Provinces, oranges. The Marketing Staff of the United Provinces and the North-West Frontier Province naturally had a good deal to do with the establishment of the grading stations in their areas. In the United Provinces, the Staff undertook much work in connection with the provincial Agricultural and Industrial Exhibition at Lucknow with the Fruit Development Board. In Bengal an appreciable amount of time was taken up in discussions with the East Indian Railway and the North Western Railway regarding the reductions which were subsequently made in the freight on fruit. The Staff there were also engaged in improving the marketing of oranges in Sikkim. In Bihar and Orissa the Marketing Staff undertook a special enquiry regarding weights and measures and carried on exhibition work. In Assam the Senior Marketing Officer provided local growers of pineapples with an outlet for their produce.

During the course of the year it became increasingly evident that nearly all the interests concerned were anxious to assist the marketing staffs in speeding up the progress of improved marketing. Progress must, however, depend on the staff and funds which can be made available by the Central and Provincial Governments. If development work is to be undertaken with the present staff and resources, there will be an inevitable slowing up in the completion of the remaining marketing surveys. As has been stated above the substantial grant of Rs. 36,000 for experimental grading and packing stations in 1937-38 was made by the I. C. A. R., but provision for local development work must mainly be a provincial matter —especially as the Central Government through the I. C. A. R. is contributing Rs. 2 lakhs per annum towards the cost of the Provincial Marketing Staffs engaged on the marketing surveys.

28. *Scheme for investigation of the insecticidal value of plant fish-poisons and other forest products.*—A two years investigation is in progress in Mysore State with the object of extending the list of indigenous insecticides. The scheme was approved in 1932 and funds provided in 1935.

A number of plant substances are locally used as fish poisons. One such substance found to possess insecticidal properties was examined and the active principle shown to be similar to that of the widely used derris root. The study has been extended to 16 plants used in Mysore as fish-poisons and insecticides, tests being made with a number of insect types. The plant extracts are tested both as stomach poisons and as contact insecticides.

Of all the plants, *Tephrosia candida* and *Tephrosia villosa*, were found to be most toxic on a number of insects, the activity being concentrated in their seeds. Then come *Anona reticulata* and *Mundulea suberosa* in the order of their toxicity. The other plants were found to be specific in their toxicity. None of these plants was found to have as high a toxic action as Nicotine sulphate, the standard contact poison used but a number of

the extracts were found to be slightly less than the nicotine sulphate in their toxicity, against green bugs (*Lecanium viride*), *Tephrosia candida* seed extract was found to be equal to nicotine sulphate in its toxic action. Chemical work on the active material from the above plants is in progress. *Tephrosia candida* gives a particularly active extract the active principle being probably related to rotenone. The scheme has been extended till the end of September, 1937.

29. *Standing Committees for Rice and Wheat.*—(*a*) *Rice Committee.*—The first meeting of the Committee which was constituted in 1936, was held on the 22nd and 23rd January 1937. Interesting notes were sent up by several Provincial Departments of Agriculture and by individual members of the Committee on various aspects of the production, marketing and general improvement of the rice crop. The research items fell into two sections *viz.*, the consideration of progress reports and technical programmes relating to the rice research schemes financed by the Imperial Council of Agricultural Research and certain more general scientific problems which may lead to the formulation of new research projects in the future.

An important discussion took place on the improvement of Statistics of Rice Production with special reference to the more accurate determination of the area under rice in permanently settled provinces and better determinations of the standard yield in all provinces. Properly randomized sampling surveys were recommended and adequate crops cutting experiments on modern lines (See also under Wheat Committee).

Other subjects discussed included the marketing of rice and paddy, the co-ordination of fertiliser experiments on rice, the possible effect of Paris green (used as an insecticide) on growing rice, the standardisation of nomenclature in papers on the Genetics of Rice and the registration of varieties. Six progress reports and four technical programmes were reviewed and several new schemes discussed.

(*b*) *Wheat Committee.*—Reference was made in paragraph 21 of the last annual report to the constitution of Standing Committee for wheat. This committee met at Simla on the 10th and 11th July 1936. Appendix IV gives a brief statement of the various subjects considered and the recommendations made by the Committee. One of the principal recommendations related to the broadcasting of weekly reports of prices and market conditions from Delhi. The Committee also recommended that a sub-station of the Rust Research Station at Simla should be located at the most suitable site in Peninsular India, and that the Provinces and States concerned should be requested to examine the question and make recommendations upon the location of the station. Action is being taken on the various recommendations.

30. *International Institute of Agriculture, Rome.*—The thirteenth General Assembly of the International Institute of Agriculture, Rome, was held from the 5th to the 10th October 1936 and India was represented thereat by Mr. B. Rama Rau, C.I.E., I.C.S., Deputy High Commissioner for India and Mr. S. R. Zaman, I.C.S., Secretary, Public Department, Office of the High Commissioner for India, London. As in previous years the High Commissioner represented India on the Permanent Committee of the Institute.

The following resolutions of the General Assembly are of interest to India:—

"The General Assembly,

being of the opinion that the statistical and economic work of the Institute, the results of which are contained in its various publications, constitutes, the most important and indispensable part of the regular services provided by the Institute,

requests the Permanent Committee to take any steps within its power to ensure that it reaches the highest possible standard of quality."

"The General Assembly,

recommends to continue the enquiries based upon Farm Accountancy and to publish their results;

it also recommends to undertake the publication of new monographic studies on the same lines as those already made upon Cotton and Meat.

It further recommends that, among other subjects, the Permanent Committee give consideration to the desirability of preparing and publishing a monograph on the subject of the Production and International Trade in Animal Fats and Vegetable and Marine Oils, with particular reference to the present and probable future competition between the various classes of Fats and Oils in International Commerce.

It also recommends to the Permanent Committee to take into consideration the desirability of preparing and publishing a Monograph on the Collection and Utilisation of the Waste Products and Residues of human and animal food as fertilisers and in agricultural industries, similar to the Monograph compiled in 1922 by the late Professor Bruttini and published by the Institute."

"The General Assembly recommends that the Permanent Committee review carefully the work that is now being done by the Institute in the field of Agricultural Legislation and Government Measures affecting Prices with a view to improvements through unification and possible reduction, through closer selection of items, in the quantity of material published. The main objective should be greater timelines in the publication of the important developments in this field."

"The General Assembly also requests the Permanent Committee to consider the possibility of publishing the Yearbook of Agricultural Legislation and other documents in English as well as in French."

"The General Assembly,

is happy to note the part played by the International Institute of Agriculture in its studies of the Problem of Nutrition;

hopes that these studies, which are at present incomplete, will be energetically continued and that they will be followed with the utmost interest by the farmers, whose true duty and interest lie in giving satisfaction to the requirements of the consumers as regards both quantity and quality;

is of the opinion that the data contained in the Report of the Mixed Committee on the Problem of Nutrition of the League of Nations, a Report which is submitted as provisional only, do not at present

allow conclusions to be drawn as regards economic agricultural policy and that is the duty of the official and vocational agricultural organisations to take the initiative in making practical suggestions for giving effect to guiding rules of a scientific character;

calls upon the Permanent Committee to maintain and to strengthen its collaboration with the Mixed Committee and to continue the study of all aspects of the Problem of Nutrition, notably in order to determine the results of the studies and experiments made by specialists in hygiene, in connection with agricultural production, the distribution of crops, the nutrition of the peasant classes and of the underfed population, the supply of markets and a fair remuneration for the farming class;

requests the Permanent Committee to direct its studies and investigations relating to nutrition, not only to agricultural production, but also to give attention to the requirements of consumption."

31. *Publications.*—(*i*) *Journals.*—The three Journals published by the Council, *viz.*, *Agriculture and Livestock in India* (bimonthly), *The Indian Journal of Agricultural Science* (bimonthly) and *The Indian Journal of Veterinary Science and Animal Husbandry* (quarterly), entered upon their seventh year of life during the year under report.

The number of original articles published in *Agriculture and Livestock in India* was thirty-eight, of which twenty-three related to crops and soils and fifteen to animal hunbandry subjects. In addition the journal contained seventy-five abstracts, forty-one notes and eleven reviews. The series of special popular articles on agricultural and animal husbandry subjects of general interest, which was commenced last year, was continued during the year and the following articles appeared in the series:—

'A note on the Control of Rinderpest in India.

Some Methods of Soil Management.

Sugarcane Varieties, a major Factor in Crop Improvement.

Suitable Fodder crops for livestock in S. India.

There is evidence of a growing demand for popular articles of this type from the educated public interested in agriculture, and it was accordingly decided to continue the publication of the present series of popular articles during the following year and to cover other important subjects of practical interest. It was also decided to publish from the following year an "Editorial" in each issue, which will be an additional feature of general interest. Mention may also be made of a series of illustrated articles on "Sons of the Soil (Studies of the Indian Cultivator)" dealing with many of the varied peasant types in India, which was planned to commence from May (1937) Number of this Journal.

The six numbers of *The Indian Journal of Agricultural Science* published during the year contained altogether seventy-seven original contributions, of which twenty-eight may be classed as botanical, eleven as entomological, nineteen as chemical, nine as statistical and ten dealt

with plant diseases. In addition, there were three notes, four abstracts and five book reviews. Of the twenty-three original contributions published in *The Indian Journal of Veterinary Science and Animal Husbandry*, sixteen dealt with animal diseases, four with animal nutrition and three with dairying. The arrangement started last year for publishing in this journal abstracts of articles selected from foreign literature which would be of interest to Indian field workers, was continued and thirteen such abstracts were published during 1936-37.

(*ii*) *Monographs, Bulletins, etc.*—Apart from the Journals mentioned above the following publications were issued during the year:—

(*a*) Miscellaneous Bulletins.—

No. 9. Statistical Methods and their Application to Agronomy. A Bibliography, by K. K. Guha Roy.

No. 10. Diseases of Sugarcane and Methods for their Control, by L. S. Subrahmaniam.

No. 11. Tables of Standard Errors of Mendelian Ratios, compiled by Swarn Singh Purewal, M.Sc., Ph.D. (Cornell) and P. Krishna Rao, L. Ag.

No. 12. List of Publications on the Botany of India Crops, Part II, for the period 1928-32, by R. D. Bose.

No. 13. Two New Statistical Tables based upon Fisher's 't' by M. Vaidyanathan.

No. 14. List of Publications on Indian Entomology (1935), compiled by the Imperial Entomologist, Pusa.

(*b*) A handbook of Statistics for use in Plant Breeding and Agricultural Problems, by Dr. F. J. F. Shaw.

(*c*) Agriculture and Animal Husbandry in India, 1933-35 (previously called Review of Agricultural Operations in India), Part I. Crop production, Part II—Animal Husbandry.

The following publications were in the press at the end of the year:—

(*a*) Scientific Monograph No. II—Investigations on the course and Distribution of the Nerves supplying *Levator anguli scapuli* and Rhomboideus Muscles and the formation of the Phrenic Nerve in the Ox, with Observations, on certain Anatomical Deviations, by H. N. Chelva Ayyangar, G. M. V. C.

(*b*) Miscellaneous Bulletins—

No. 15. Selected Clinical Articles, Part II, by G. K. Sharma; R. L. Kaura and S. Ganapathy Iyer; and G. K. Sharma and G. S. Khan,

No. 16. Indian Grazing Conditions and the Mineral Content of some Indian Fodders, by P. E. Lander.

A complete list of the publications of the Council is given in Appendix V.

(iii) Supply of Publications.—The following table shows the circulation figures for the Council's publications during the year under report—

Name of periodical	Supplied as exchanges *	Sales	Distributed free
Agriculture and Livestock in India . .	462	250†	105
The Indian Journal of Agricultural Science.	373	163†	55
The Indian Journal of Veterinary Science and Animal Husbandry.	334	117†	40
Scientific Monographs	210	80	13
Miscellaneous Bulletins	205	226	26

*Includes those supplied as exchanges by the Directors, Imperial Agricultural Research Institute and Imperial Veterinary Research Institute.

†Permanent subscribers and average casual sales during the year.

By far the largest number of copies supplied as exchanges in India fell under the Council's arrangement for the reciprocal exchange of publications among the agricultural and veterinary departments in India. It is gratifying to report that this arrangement which was started in 1934 has been working smoothly since then and has ensured the regular supply of official agricultural and veterinary publications in India to the officers in the various departments. The free lists for the publications included leading newspapers and periodicals in English and the Indian languages, important non-official agricultural and rural uplift organisations, public libraries, Chambers of Commerce and industrial organisations in India. The following classified statement shows the number of institutions in India and abroad which received the Council's publications either free or on exchange basis during the year:—

1. No. of exchange institutions in India*	272
2. No. of exchange institutions abroad*	412
(a) *British Empire*—	
Great Britain	74
Canada.	10
Australia	21
New Zealand	7
Ceylon	7
South Africa	18
	137

(*b*) Africa	20
(*c*) Russia	15
(*d*) Continent of Europe	72
(*e*) China	6
(*f*) Japan	17
(*g*) U. S. A.	84
Other countries	61
Grand Total	412

*Include those of the Directors, Imperial Agricultural Research Institute and Imperial Veterinary Research Institute.

No. of scientific institutions in India receiving free copies (other than as exchanges)	15
No. of scientific institutions abroad receiving free copies (other than as exchanges)	10
No. of newspapers and periodicals in India receiving free copies.	28

Besides the above regular supplies, about 120 requests for copies of individual articles in journals were received from research workers and occasional applicants, and these were met by the supply of "separates". A limited free supply of Pusa Bulletins and certain other earlier series of publications of the Imperial Department of Agriculture was also made available to departments and universities in India to enable them to complete their library sets.

(*iv*) *Editorial Committee and Referees.*—Prof. T. Ekambaram, M.A., L. T., Ph.D., Professor of Botany Presidency College, Madras, served on the Editorial Committee as the University representative. The Council's panel of honorary referees, for the examination of papers received for publication, consisted of eighty-one scientists serving in departments and universities in India and the Council has once again to record its deep sense of appreciation of the valuable help rendered by them without which it would not have been possible to maintain the present standard of its publications.

32. *Library.*—At the close of the year under review the Library possessed a collection of 16,150 books and over 10,000 pamphlets and reprints relating to agriculture and cognate subjects. 2,964 books, official reports and pamphlets were added during 1936-37 chiefly by exchange, which now extends to all the important countries of the world. The New additions comprise 2,011 exchange publications, 375 purchased from the research funds the rest being received free of charge. As usual the United States of America contributed the largest number of exchange publications and the Council is greatly indebted to that country for this continued generosity. The details of the exchanges are given in Appendix VI.

The number of the current periodicals increased from 286 to 307, 107 journals being purchased, and 182 received in exchange against 167 last year. A classified list of the important periodicals received is given in Appendix VII.

Since the publication of the catalogue the resources of the Library have been drawn upon more frequently than before. There has been a recorded circulation of 2,069 books and 5,675 issues of the periodicals—

a total of 7,744 publications as compared to 4,925 last year. These figures exclude the use of the books in the Library Reading Room and the Officers' Sectional Libraries of which no record is kept.

The printed Library Catalogue incorporating entries of the books received upto 31st December 1934 and the Supplementary Catalogue for 1935 were distributed to the Members of the Governing Body and the Advisory Board and other research workers in the Provinces. In addition two quarterly lists of publications received from January to June 1936 were also printed and distributed. It was subsequently decided to issue half-yearly lists of additions and the list for July to December 1936 is in the Press. Besides the printed catalogue a set of Card Catalogue is maintained in the Library, and about 3,000 cards were typed for this set.

There has been an increased use of the Reading Room during the year and over 100 persons visited the Library to consult reference books. Several requests for lists of references to literature were received and complied with.

33. *Accounts.*—A statement of audited accounts of the Council for 1935-36 is given in Appendix VIII.

34. *Scientific and Technical Officers.*—A list (Appendix IX) of scientific and technical officers paid from the research grants of the Imperial Council of Agricultural Research as on the 31st March 1937 is appended.

N. C. MEHTA,
Secretary,
Imperial Council of Agricultural Research.

APPENDIX I.

Imperial Council of Agricultural Research, Governing Body.

1. The Hon'ble Kunwar Sir Jagdish Prashad, Kt., C.S.I., C.I.E., O.B.E., Chairman, Imperial Council of Agricultural Research.
2. Sir Bryce C. Burt, Kt., C.I.E., M.B.E., I.A.S.
3. The Hon'ble Minister for Agriculture, Madras Presidency.
4. The Hon'ble Minister for Agriculture, Bombay Presidency.
5. The Hon'ble Minister for Agriculture, Bengal Presidency.
6. The Hon'ble Minister for Education, United Provinces.
7. The Hon'ble Minister for Agriculture, Punjab.
8. The Hon'ble Minister for Agriculture, Burma.
9. The Hon'ble Minister for Agriculture, Bihar.
10. The Hon'ble Minister for Agriculture, Central Provinces.
11. The Hon'ble Minister for Agriculture, Assam.
12. The Hon'ble Minister for Agriculture, North-West Frontier Province.
13. The Revenue Commissioner, Government of Orissa.
14. The Revenue Member to the Government of H. E. H. the Nizam of Hyderabad.
15. The Member in charge of Agriculture, Mysore Executive Council.
16. The Member in charge of Agriculture, Baroda Executive Council, Baroda.
17. The Revenue Minister, Government of Jammu and Kashmir.
18. The Diwan of Cochin.
19. The Diwan of Travancore.
20. The Revenue Member, Bhopal State Council.
21. The Hon'ble Sir Frank Noyce, K.C.S.I., C.B.E., I.C.S., Member of the Governor General's Executive Council, in charge of Industries and Labour Department.
22. The Hon'ble Mr. Hossain Imam—Representative of the Council of State.
23. Pandit Sri Krishna Datt Palival, M.L.A.
24. Mr. Mohd. Azhar Ali, M.L.A.

} Representatives of the Legislative Assembly.

25. Sir Joseph Kay, Kt., Representative of the Associated Chambers of Commerce of India.
26. Mr. Chunilal B. Mehta, Representative of the Federation of Indian Chambers of Commerce and Industry.
27. Mr. P. J. Kerr, M.R.C.V.S., I.V.S., Director, Civil Veterinary Department and Veterinary Adviser to the Government of Bengal, Calcutta.
28. Mr. P. H. Carpenter, Chief Scientific Officer, Indian Tea Association, Tocklai Experimental Station, Cinnamara P. O. (Assam).

} Representatives of the Advisory Board.

29. Diwan Bahadur Sir T. Vijayaraghavacharya, K.B.E.

Imperial Council of Agricultural Research—Advisory Board.

1. The Vice-Chairman, Imperial Council of Agricultural Research.
2. The Agricultural Expert, Imperial Council of Agricultural Research.
3. The Animal Husbandry Expert, Imperial Council of Agricultural Research.
4. Mr. A. M. Livingstone, M.A., B.Sc., M.C., Agricultural Marketing Adviser to the Government of India.
5. The Director, Imperial Agricultural Research Institute.
6. The Director, Imperial Veterinary Research Institute, Muktesar.
7. The Director, Indian Institute of Science, Bangalore.
8. The Director of Agriculture, Madras.

9. The Director of Agriculture, Bombay Presidency.
10. The Director of Agriculture, Bengal.
11. The Director of Agriculture, United Provinces.
12. The Director of Agriculture, Punjab.
13. The Director of Agriculture, Burma.
14. The Director of Agriculture, Bihar.
15. The Director of Agriculture, Central Provinces.
16. The Director of Agriculture, Assam.
17. The Director of Agriculture, North-West Frontier Province.
18. The Deputy Director of Agriculture, Orissa.
19. Mr. P. T. Saunders, O.B.E., M.R.C.V.S., I.V.S, Director of Veterinary Services, Madras.
20. Mr. E. S. Farbrother, M.R.C.V.S., I.V.S., Director of Veterinary Services, Bombay Presidency.
21. Mr. P. J. Kerr, M.R.C.V.S., I.V.S., Director, Civil Veterinary Department and Veterinary Adviser to the Government of Bengal.
22. Mr. T. J. Egan, I.V.S., Director, Civil Veterinary Department, United Provinces.
23. Mr. T. F. Quirke, M.R.C.V.S., I.V.S., Director of Veterinary Services, Punjab.
24. Mr. D. T. Mitchell, M.R.C.V.S., Director of Veterinary Services, Burma.
25. Major P. B. Riley, I.V.S., Director of Veterinary Services, Bihar.
26. Rai Bahadur R. V. Pillai, Director of Veterinary Services, Central Provinces.
27. Rai Sahib Srish Chandra Ghosh, G.B.V.C., Office of the Superintendent, Civil Veterinary Department, Assam.
28. Mr. S. M. A. Shah, M.R.C.V.S., Superintendent, Civil Veterinary Department, North-West Frontier Province.
29. Mr. J. H. G. Jerron, M.R.C.V.S., I.V.S., Director of Civil Veterinary Services, Sind.
30. The Assistant Director, Veterinary Services, Orissa.
31. The Director of Agriculture, H. E. H. the Nizam's Government, Hyderabad (Deccan).
32. The Director of Veterinary Department, H. E. H. the Nizam's Government, Hyderabad (Deccan).
33. The Director of Agriculture, Mysore State.
34. The Superintendent, Civil Veterinary Department, Mysore State.
35. The Director of Agriculture, Baroda State, Baroda.
36. The Deputy Director of Agriculture, Baroda State, Baroda.
37. The Superintendent of Agriculture, Cochin State, Cochin.
38. The Senior Veterinary Inspector, Cochin State.
39. The Director of Agriculture and Fisheries, Travancore, Trivandrum.
40. The Director of Agriculture, Bhopal State, Bhopal.
41. The Director of Veterinary Services, Bhopal State, Bhopal
42. The Director of Agriculture, Kashmir.
43. The Superintendent, Civil Veterinary Dept., Kashmir.
44. Mr. A. M. Mustafa, Agricultural Officer, Baluchistan—Representative of minor administrations under the Government of India.
45. The Inspector General of Forests, Forest Research Institute, Dehra Dun—Representative of the Forest Research Institute, Dehra Dun.
46. Diwan Bahadur T. Raghaviah, C.S.I., Cathedral P. O. Graeme's Road, Madras—Representative of the Co-operative Movement.
47. Col. A. J. H. Russell, C.I.E., I.M.S., Public Health Commissioner with the Government of India, Representative of the Indian Research Fund Association.

48. Prof. C. N. Vakil, M.A., M.Sc., F.S.S., University Professor of Economics, Bombay University.
49. Dr. J. C. Ghosh, D. Sc., Dacca University.
50. Prof. P. K. Parija, M.A. (Cantab), Ramshaw College, Cuttack.
51. Dr. L. K. Hyder, Ph.D., C.I.E.

} Representatives of the Inter-University Board.

52. Mr. P. H. Carpenter, Chief Scientific Officer, Indian Tea Association, Tocklai Experimental Station, Cinnamara P. O. (Assam)—Representative of the Indian Tea Association and the United Planters' Association of South India.
53 Rao Bahadur Bhimbhai R. Naik, M.L.C.—Representative of the Indian Central Cotton Committee, Sagrampura, Surat.
54. The Director of Veterinary Services in India, Q. M. G.'s Branch, Army Headquarters.
55. The Central Publicity Officer, Indian State Railways.
56. The Director of Agriculture, Sind.
57. The Director, Industrial Intelligence and Research Bureau.
58. Maulvi Sir Mohammed Yakub, Kt., M.L.A., Moradabad.
59. Dr. Nazir Ahmad, M.Sc., Ph.D. (Cantab.), Director, Technological Laboratory, Indian Central Cotton Committee, Matunga, Bombay.
60. Sir Chunilal V. Mehta, Kt., K.C.S.I., Neville House, Currimbhoy Road Ballard Estate, Bombay.
61. Rao Bahadur M. Vaidyanathan, M.A., L.T., Statistician, Imperial Council of Agricultural Research.
62. Sardar Datar Singh, Cattle and Dairy Farm, Montgomery.
63. Raja Jagannath Baksh Singh.

GOVERNMENT OF INDIA.

Imperial Council of Agricultural Research Department.

Hon'ble Member for the Imperial Council of Agricultural Research Department :—
The Hon'ble Kunwar Sir Jagdish Prasad, Kt., C.S.I., C.I.E., O.B.E.
Sir Bryce Burt, Kt., C.I.E., M.B.E., B.Sc., I.A.S., officiating Vice-Chairman.
Mr. N. C. Mehta, B.A., Bar-at-Law, I.C.S., Secretary.
Mr. F. Ware, F.R.C.V.S., I.V.S., offg. Animal Husbandry Expert.
Dr. W. Burns, D.Sc., I.A.S., officiating Agricultural Expert.
Mr. A. M. Livingstone, M.C., M.A., B.Sc., Marketing Expert, I.C.A.R., and Agricultural Marketing Adviser to the Government of India.
Mr. R. C. Srivastava, B.Sc., Director, Imperial Institute of Sugar Technology.
Mr. Bazlul Karim, Superintendent.
Mr. P. M. Sundaram, B.A., Superintendent.

Research side.

Rao Bahadur Y. Ramachandra Rao, M.A., F.E.S., Locust Research Entomologist.
Rao Bahadur M. Vaidyanathan, M.A., L.T., F.S.S., Statistician.
Mr. Ramji Das Kapur, M.A., Chief Economist.
Mr. R. L. Sethi, M.Sc., B.Sc., Agri. (Edin.), M.R.A.S., I.A.S., Officer on Special Duty.
Capt. A. C. Aggarwala, A.I.R.O., M.R.C.V.S., V.S.C. (Hons.), Officer on Special Duty.
Mr. N. B. Bonarjee, I.C.S., Officer on Special Duty.

APPENDIX II.

Personnel of the reconstituted Animal Nutrition, Cattle Breeding and Dairying Standing Committees.

I.—*Animal Nutrition Committee.*

*1. The Vice-Chairman, Imperial Council of Agricultural Research.
*2. The Animal Husbandry Expert, Imperial Council of Agricultural Research.
3. Mr. A. V. Iyer, Offg. Physiological Chemist, Bangalore.
4. Dr. P. E. Lander, Agricultural Chemist, Punjab.
5. Dr. K. C. Sen, Bio-Chemist, Imperial Institute of Veterinary Research, Muktesar.
*6. Rao Bahadur B. Viswanath, Offg. Director, Imperial Institute of Agricultural Research.
7. Mr. J. R. Haddow, Veterinary Research Officer, Imperial Institute of Veterinary Research, Muktesar.
8. Mr. Zal R. Kothawala, Imperial Dairy Expert, Bangalore.
*9. Mr. F. Ware, Director, Imperial Institute of Veterinary Research, Muktesar.
*10. Brigadier H. C. Dibben, Director of Veterinary Services, Army Headquarters, Simla.
11. Dr. W. R. Akroyd, Director, Nutrition Research, Indian Research Fund Association, Coonoor.
*12. Mr. T. F. Quirke, Director of Veterinary Services, Punjab.
13. Mr. M. Carbery, Agricultural Chemist, Bengal Government, Dacca.
*14. Dr. J. K. Dubey, Director of Agriculture, Bhopal.
*15. Mr. P. J. Kerr, Director of Veterinary Services, Bengal.
*16. Mr. E. S. Farbrother, Director of Veterinary Services, Bombay.
17. Dr. Burch H. Schneider, Agricultural Institute, Allahabad.
*18. Mr. T. J. Egan, Director, Civil Veterinary Department, United Provinces.
19. Mr. C. H. Parr, Deputy Director of Agriculture, Bundelkhand.
20. The Agricultural Chemist, Coimbatore.
21. Mr. D. V. Bal, Agricultural Chemist, Central Provinces.

Secretary, Imperial Council of Agricultural Research.

II.—*Cattle Breeding Committee.*

*1. The Vice-Chairman, Imperial Council of Agricultural Research.
*2. The Animal Husbandry Expert, Imperial Council of Agricultural Research.
*3. Mr. T. F. Quirke, Director of Veterinary Services, Punjab.
4. Captain C. E. McGuckin, Assistant Director, Military Dairies, Lahore Cantonment.
5. Mr. E. J. Bruen, Livestock Expert, Bombay.
6. Chowdhury Dost Mohammad Khan, Proprietor, Jahangirabad Cattle Farm, District Montgomery.
7. Mr. C. H. Parr, Deputy Director of Agriculture, Bundelkhand.
8. Mr. Zal R. Kothawala, Imperial Dairy Expert, Bangalore.
*9. Major P. B. Riley, Director of Veterinary Services, Bihar and Orissa.
10. Mr. Wynne Sayer, Imperial Institute of Agricultural Research, Delhi.
*11. Mr. T. J. Egan, Director, Civil Veterinary Department, United Provinces.
12. Senior Marketing Officer dealing with Livestock.
*13. Sardar Datar Singh, Montgomery.
14. Mr. K. P. R. Kartha, Statistical Assistant, Animal Husbandry Bureau, Imperial Council of Agricultural Research.

15. Mr. F. J. Gossip, Livestock Expert, Bengal.
*16. Mr. S. M. A. Shah, Superintendent, Civil Veterinary Department, North-West Frontier Province.
17. Mr. R. W. Littlewood, Deputy Director of Agriculture (Livestock), Madras.
18. Mr. J. V. Takle, Deputy Director of Agriculture (Livestock), Central Provinces.
19. Mr. R. C. Woodford, Deputy Director of Agriculture (Livestock), Assam.
20. Sardar Santokh Singh, Shahkot, Punjab.
*21. Mr. F. Ware, Director, Imperial Institute of Veterinary Research, Muktesar.
22. Mr. N. M. Kothavala, Ahmedabad.
*23. Sir Chunilal V. Mehta, Bombay.
*24. Director of Agriculture, Mysore.
25. Pattagar of Palayakotai.
26. Mr. B. K. Badami, Director, Civil Veterinary Department, Hyderabad.

Secretary, Imperial Council of Agricultural Research.

III.—*Dairying Committee.*

*1. The Vice-Chairman, Imperial Council of Agricultural Research.
*2. The Animal Husbandry Expert, Imperial Council of Agricultural Research.
3. The Imperial Dairy Expert, Bangalore.
4. The Director of Military Farms, (or Representative).
5. Mr. W. Keventer of Messrs. Keventer & Company, Aligarh.
6. Mr. R. C. Woodford, Deputy Director of Agriculture (Livestock), Assam.
7. Mr. E. J. Bruen, Livestock Expert, Bombay.
8. Mr. R. W. Littlewood, Deputy Director of Agriculture (Livestock), Hosur, Madras.
*9. Mr. F. Ware, Director, Imperial Institute of Veterinary Research, Muktesar.
10. Mr. A. C. Agarwala, Professor of Veterinary College, Lahore.
11. Mr. J. V. Takle, Deputy Director of Agriculture, (Livestock), Central Provinces.
12. Mr. Wynne Sayer, Imperial Agriculturist, Delhi.
*13. Sardar Datar Singh, Montgomery.
14. Mr. F. J. Gossip, Livestock Expert, Bengal.

Secretary, Imperial Council of Agricultural Research.

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*Denotes Members of the Advisory Board.

APPENDIX III.

Personnel of the Locust Committee.

1. Vice Chairman, Imperial Council of Agricultural Research (Chairman *Ex-officio*).
2. Agricultural Expert, Imperial Council of Agricultural Research.
3. Director of Agriculture, Punjab.
4. Entomologist to Government, United Provinces.
5. Entomologist to Government, Punjab.
6. Imperial Entomologist, Imperial Agricultural Research Institute.
7. Director of Agriculture and Allied Departments, North-West Frontier Province.
8. Director of Agriculture, Sind.

Secretary, Imperial Council of Agricultural Research (Secretary, *Ex-officio.*)

APPENDIX IV.

Subjects considered and Recommendations made by the Wheat Committee.

Subject.	Recommendation.
1. Improvement of statistics of wheat production.	(*i*) Local Governments should be invited to put up definite proposals for improving statistical organisation. (*ii*) It was resolved to recommend to all the provinces to undertake a system of carefully planned randomised crop cutting experiments over a period of years with a view to ascertaining standard yields.
2. Improvement of statistics relating to milling of wheat and wheat products.	Attention of Local Governments should be drawn to this very important point and they should be requested to do what they can to make these statistics complete. The Provincial Marketing Officers should be asked to look up the mills which did not supply the information and explain the importance of these returns.
3. Present position of wheat research and the introduction of improved varieties into general cultivation.	The Chairman promised that all members of the Committee would be supplied with the recent publications on wheat of the Imperial Council of Agricultural Research. Reprints of articles from the Journals of the Council could be supplied after publication.
4(*a*) Grading and Marketing of wheat with a view to encourage exports and for internal trading.	Reference is invited to the proceedings of the informal conference of representatives of certain Indian grain trade Associations and Mills, with the Central Marketing Staff.
(*b*) Request from the Director of Agriculture, Bombay, that the Marwadi Chamber of Commerce should be asked to accept Bijapur wheat in its contract trading.	A resolution was adopted recommending the adoption of a standard contract form as suggested in the above proceedings.
(*c*) Proposed adoption of basis of 10 per cent red wheat in white wheat with mutual allowances.	The Agricultural Marketing Adviser would see what could be done about item (*c*).
5. Distribution of pure wheat seed and the need for more precise information regarding areas under pure types.	It is desirable to have the figures about the various tracts growing pure varieties of wheat. Local Governments should be asked to look into the matter of the actual areas under pure varieties.
6. Consumption and movement of wheat in the Bombay Presidency.	This should be postponed till the Marketing Surveys were completed.
7. Broadcasting of wheat Prices.	The possibility of a weekly talk on prices of wheat should be considered. Delhi should be the Broadcasting Centre and the talks might be relayed simultaneously from Calcutta and Bombay. It was decided to address the Director of Broadcasting accordingly. The Agricultural Marketing Adviser should be asked to make arrangements to obtain the requisite information for the talks.
8. Significance of the increase in the imports of wheat flour into the United Provinces during the last two years and the action, if any, that should be taken in this connection.	It is dangerous to draw any conclusions from the rail borne trade figures. There was no need for anxiety in regard to improved imports of wheat and flour into the United Provinces and it was not established that the increase of sugarcane had affected the area under wheat.

Subject.	Recommendation.
9. Registration of wheat varieties.	A register should be maintained at the Imperial Agricultural Research Institute of all varieties of which an Agricultural Department or a recognised plant-breeding institution had pure seed, the pure seed of the registered type being maintained at the Institute. The list would be maintained in two parts—those of Commercial and those of scientific interest. It would be published in one of the Journals of the Council. This would be mainly for Indian wheats.
10. Proposal for a technical Institute for the investigation of cereals.	The following Resolution was passed unanimously :— "This Committee recognises the importance of milling and baking tests and the chemical studies of quality in wheat and recommends the appointment of a Cereal Technologist. The committee considers that research on wheat products such as Force etc., is not called for at present but the study of cereal technology should include the suitability of wheats for the manufacture of *Chapatis, puries* and other products used in India."
11. Extension to the Punjab of rust resistance testing of wheat.	(*i*) Dr. K. C. Mehta will continue to test wheats produced by provincial wheat breeders for resistance to Physiological forms of rust. (*ii*) As soon as Dr. B. P. Pal has hybrids showing satisfactory resistance to particular forms of rust, he will distribute them at the earliest possible stage to wheat breeders in different provinces in order that selection work for economic characters could be commenced there. To meet the needs of Sind it was decided that Dr. Pal would see whether he could use C. P. H. 47 as one of the parents for hybrids.
12. Rust Research in Bombay Deccan.	A sub-station of the Rust Research Station at Simla should be located at the most suitable site in Peninsular India and that the provinces and states concerned should be requested to examine the question and make recommendations upon the location of the station.
13. Need for experiments to determine the natural moisture content of wheat at different centres in the country in different seasons.	Agricultural chemists concerned should be asked if they would take up experiments on moisture determination in Lyallpur and Amritsar in the Punjab, Cawnpore and Muzaffarnagar in the United Provinces, Jubbulpore and Nagpur in the Central Provinces, Sakrand Station in Sind, Bombay, Calcutta and Karachi.
14. Need for cheap and efficient threshing and winnowing machines.	The committee concluded that there was demand for a cheap winnower but except in Sind not for a thresher, and called attention to the fact that the Research Council will be offering a gold medal and two silver medals for this class of implement in the coming year. This Committee recommends the Muzaffarnagar plan of wheat storage in cement *Khattis* as described by the Secretary of the Council to the notice of the Provincial Agriculture Departments as well as commercial bodies.

APPENDIX V.

Publications of the Imperial Council of Agricultural Research, India.

1. Agriculture and Live-stock in India

A bi-monthly Journal of Agriculture and Animal Husbandry for the general reader interested in Agriculture or Live-stock in India or the Tropics. (Established 1931. Published in January, March, May, July, September and November. Prepayable subscription Rs. 6 or 9*s.* 9*d.* per annum inclusive of Indian postage. Price per part Rs. 2 or 3*s.* 6*d.* inclusive of Indian postage.) Volumes I to VI complete are available.

2. The Indian Journal of Agricultural Science

A bi-monthly Scientific Journal of Agriculture and the Allied Sciences, mainly devoted to the publication of the results of original research and field experiments. (Established 1931. Published in February, April, June, August, October and December. Prepayable subscription Rs. 15 or 24*s.* per annum inclusive of Indian postage. Price per part Rs. 3 or 5*s.* 3*d.* inclusive of Indian postage.) Volumes I to VI complete are available.

3. The Indian Journal of Veterinary Science and Animal Husbandry

A quarterly Journal for the publication of scientific matter relating to the health, nutrition and breeding of live-stock. (Established 1931. Published in March, June, September and December. Prepayable subscription Rs. 6 or 9*s.* 9*d.* inclusive of Indian postage. Price per part Rs. 2 or 3*s.* 6*d.* inclusive of Indian postage.) Volumes I to VI complete are available.

4. Scientific Monographs of the Imperial Council of Agricultural Research

NCAG—SM/1	No. 1.	The Fungi of India, by E. J. Butler, C.I.E., D.Sc., M.B., F.R.S. and G. R. Bisby, PH.D. (1931). Price Rs. 6-12-0 or 11*s.* (As. 8).
NCAG—SM/2	No. 2.	Life-histories of Indian Microlepidoptera, Second Series: Alucitidae (Pterophoridae, Tortricina and Gelechiadae), by T. Bainbrigge Fletcher, R.N., F.L.S., F.E.S., F.Z.S. (1932). Price Rs. 3-4-0 or 5*s.* 6*d.* (As. 6).
NCAG—SM/3	No. 3.	The Open-Pan System of White-Sugar Manufacture, by R. C. Srivastava, B.Sc. (1935, 2nd edition). Price Rs. 3-2-0 or 5*s.* 6*d.* (As. 9).
NCAG—SM/4	No. 4.	Life-histories of Indian Microlepidoptera: Cosmopterygidae to Neopseustidae, by T. Bainbrigge Fletcher, R.N., F.L.S., F.E.S., F.Z.S. (1933). Price Rs. 4-8-0 or 7*s.* 6*d.* (As. 8).
NCAG—SM/5	No. 5.	The Bombay Grasses, by E. J. Batter, S.J., PH.D., F.L.S., and C. McCann, F.L.S. Illustrated by R. K. Bhide. Price Rs. 20-12-0 or 32*s.* 6*d.*
NCAG—SM/6	No. 6.	Helminth Parasites of the Domesticated Animals in India, by G. D. Bhalerao, M.Sc. Price Rs. 7-12-0 or 13*s.* 3*d.*
NCAG—SM/7	No. 7.	Influence of Manures on the Wilt Disease of *Cajanus indicus* Spreng. and the Isolation of Types Resistant to the Disease, by W. McRae, M.A., D.Sc. (Edin.), F.L.S. and F. J. F. Shaw, D.Sc. (Lond.), A.R.C.S., F.L.S. (1933). Price Rs. 2-4-0 or 4*s.* 3*d.* (As. 5).
NCAG—SM/8	No. 8.	The Silk Industry of Japan with Notes on Observations in the United States of America, England, France and Italy, by C. C. Ghosh, B.A., F.E.S. 1933). Price Rs. 4 or 6*s.* 9*d.* (As. 7).
NCAG—SM/9	No. 9.	Mechanical Cultivation in India. A History of the Large-Scale Experiments carried out by Burmah Shell Oil Storage and Distributing Company of India, Ltd., by C. P. G. Wade. Price Rs. 3-14-0 or 6*s.* 6*d.*
NCAG—SM/10	No. 10.	The Spotted Boll-worms of Cotton in South Gujarat, by B. P. Deshpande and N. T. Nadkarny. Price Rs. 5-14-0 or 9*s.* 6*d.*

NCAR—SM/11 No. 11. Investigations on the Course and Distribution of the Nerves supplying Levator anguli scapuli and Rhomboideus Muscles and the formation of the Phrenic Nerve in the Ox, with Observations, on certain Anatomical Deviations, by H. N. Chelva Ayyangar, G.M.V.C. (*In the press*).

5. Miscellaneous Bulletins of the Imperial Council of Agricultural Research

NCAG—MB/1 No. 1. List of Publications on Indian Entomology (1930), by the Imperial Entomologist, Pusa. Price As. 14 or 1*s*. 6*d*.

NCAG—MB/2 No. 2. List of Publications on Indian Entomology (1931), by the Imperial Entomologist, Pusa. Price As. 8 or 10*d*.

NCAG—MB/3 No. 3. List of Publications on Indian Entomology (1932), by the Imperial Entomologist, Pusa. Price As. 12 or 1*s*. 3*d*.

NCAG—MB/4 No. 4. Host Plant Index of Indo-Ceylonese Coccidae, by S. Ramachandran, L.Ag. and T. V. Ramakrishna Ayyar, B.A., Ph.D., F.Z.S. Price Rs. 1-10-0 or 2*s*. 9*d*.

NCAG—MB/5 No. 5, List of Publications on Indian Entomology (1933), compiled by the Officiating Imperial Entomologist, Pusa. Price As. 9 or 1*s*.

NCAG—MB/6 No. 6. Bee-keeping, by C. C. Ghose, B.A., F.E.S. (3rd Edition). Price Rs. 1-14-0 or 3*s*. 3*d*.

NCAG—MB/7 No 7. List of Publications on Indian Entomology (1934), compiled by the Officiating Imperial Entomologist and the Imperial Entomologist, Pusa. Price Rs. 1-2-0 or 2*s*.

NCAR—MB/8 No 8. Selected Clinical Articles, by G. K. Sharma, G.P.V.C. and R. L. Kaura. Price As. 8 or 10*d*.

NCAR—MB/9 No. 9. Statistical Methods and their Application to Agronomy. A Bibliography, by K. K. Guha Roy. Price Rs. 2-2-0 or 4*s*.

NCAR—MB/10 No. 10. Diseases of Sugarcane and Methods for their Control, by L. S. Subrahmaniam. Price Rs. 1-14-0 or 3*s*. 3*d*.

NCAR—MB/11 No. 11. Tables of Standard Errors of Mendelian Ratios compiled by Swarn Singh Purewal, M.Sc, Ph.D. (Cornell), and P. Krishna Rao, L.Ag. Price As. 12 or 1*s*. 3*d*.

NCAR—MB/12 No. 12. List of Publications on the Botany of Indian Crops Part II, for the Period 1928—32, by R. D. Bose. Price Rs. 3-6-0 or 5*s*. 9*d*.

NCAR—MB/13 No. 13. Two New Statistical Tables based upon Fisher's '*t*', by M. Vaidyanathan. Price As. 6 or 8*d*.

ICAR—8—14. No. 14. List of Publications on Indian Entomology (1935), compiled by the Imperial Entomologist, Pusa. Price Re. 1-4-0 or 2*s*.

ICAR—8—15 No. 15. Selected Clinical Articles, by G. K. Sharma; R. L. Kaura and S. Ganapathy Iyer; and G. K. Sharma and G. S. Khan. (*In the Press.*)

ICAR—8—16 No. 16. Indian Grazing Conditions and the Mineral Content of some Indian Fodders, by P. E. Lander (*In the Press.*)

6. Annual Report of the Imperial Council of Agricultural Research

NCAG—AR/31 . . Annual Report of the Imperial Council of Agricultural Research for the years 1929-30 and 1930-31. Price As. 12 or 1*s*. 3*d*. (Anna 1).

NCAG—AR/32 . . Annual Report of the Imperial Council of Agricultural Research for the year 1931-32. Price As. 6 or 8*d*. (As. 2).

NCAG—AR/33 . . Annual Report of the Imperial Council of Agricultural Research for the year 1932-33. Price As. 6 or 8*d*.

NCAG—AR/34 . . Annual Report of the Imperial Council of Agricultural Research for the year 1933-34.

NCAG—AR/35 . . Annual Report of the Imperial Council of Agr cultural Research for the year 1934-35.

NCAR—AR/36 . . Annual Report of the Imperial Council of Agricultural Research for the year 1935-36.

7. Agriculture and Animal Husbandry in India (called Review of Agricultural Operations in India up to 1933)

NCAG—R 1/29 . . Review of Agricultural Operations in India, 1928-29. Price Rs. 3-2-0 or 5*s*. 6*d*. (As. 8).

NCAG—R 1/31 . . Review of Agricultural Operations in India, 1929-31. Price Rs. 5 or 8*s*. 3*d*. (As. 10).

NCAR—RI/31-33 . . Review of Agricultural Operations in India, 1931-33. Price Rs. 5-12-0 or 9*s*. 6*d*.

Agriculture and Animal Husbandry in India, 1933-34 and 1934-35. Part I.—Crop Production. Price Rs. 4-14-0 or 8*s*. Part II.—Animal Husbandry. Price Re. 1 or 1*s*. 9*d*.

8. Proceedings of the Board of Agriculture and Animal Husbandry

Proceedings of the First Meeting of the Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry held at New Delhi from the 20th to 23rd February 1933, with Appendices. Price Rs. 5-14-0 or 9*s*. 6*d*.

Proceedings of the First Meeting of the Crops and Soils Wing of the Board of Agriculture and Animal Husbandry in India held at Delhi from the 25th February to the 2nd March 1935, with Appendices. Price Rs. 6 or 9*s*. 9*d*.

A description of the Imperial Institute of Veterinary Research, Muktesar, and its Substation, the Imperial Veterinary Serum Institute, Izatnagar, by F. Ware, F.R.C.V.S. Price Re. 1-4-0 or 2*s*.

The Production of Cigarette Tobacco by Flue-curing, by F. J. F. Shaw, C.I.E., D.Sc., A.R.C.S., F.L.S. and Kashi Ram. *Imp. Inst. Agri. Res. Pusa. Bull.* No. 187. Reprinted (1935). Price Re. 1 or 1*s*. 9*d*.

A Handbook of Statistics for use in Plant Breeding and Agricultural Problems by F. J. F. Shaw, C.I.E., D.Sc., A.R.C.S., F.L.S. Price Rs. 4-6-0 or 7*s*. 3*d*.

Copies of the above publications can be had from—

In India.—Manager of Publications, Civil Lines, Delhi.

In Europe and America.—From Public Department (Publications Branch), Office of the High Commissioner for India, India House, Aldwych, London, W. C. 2.

APPENDIX VI.

Books and Publications received as Library exchanges.

Names of countries.	Number of books and publications, etc., received.	Number of periodicals received.
1. Afghanistan	..	1
2. Africa	62	6
3. Argentine	11	1
4. Australia	42	3
5. Belgium	24	2
6. Brazil	9	1
7. British Guiana	2	1
8. Canada	24	2
9. Ceylon	1	1
10. Czechoslovakia	..	..
11. China	45	3
12. Cyprus	4	2
13. Denmark	1	2
14. Dutch East Indies	9	2
15. Fiji	2	1
16. France	4	4
17. Germany	3	6
18. Great Britain	377	32
19. Holland	22	..
20. India—		
(*a*) Central and Local Governments	331	30
(*b*) Private bodies and States	83	30
21. Indo-China	..	1
22. International Institute of Agriculture, Rome	30	4
23. Italy	..	2
24. Japan	..	6
25. League of Nations	67	9
26. New Zealand	10	2
27. Palestine	3	..
28. Philippines	43	4
29. Poland	1	2
30. Romania	..	..
31. Russia	83	7
32. Straits Settlement and Federated Malay	21	6
33. United States	681	8
34. Venezuela	5	..
35. West Indies	11	3
Total	2,011	182

APPENDIX VII.

List of Journals received in the Library, Imperial Council of Agricultural Research.
Agricultural Engineering.

1. AGRICULTURAL ENGINEERING. (1937—).
2. IMPLEMENT AND MACHINERY REVIEW (England). Vol. 55. (1930 —).

Agriculture.

3. AGRICOLTURA COLONIALE (Italy). Vol. 28. (1934 —).
4. AGRICULTURA SINICA (China). Vol. 1. (1934 —).
5. AGRICULTURAL JOURNAL OF BRITISH GUIANA, Vol. 1. (1928 —).
6. AGRICULTURAL JOURNAL, Fiji. Vol. 3. (1930 —).
7. AGRICULTURAL GAZETTE OF NEW SOUTH WALES.
8. AGRICULTURAL INDEX. (U. S. A.). (1916 —).
9. AGRICULTURAL JOURNAL OF U. P.
10. AGRICULTURE AND ANIMAL HUSBANDRY IN INDIA 1933-34—
    Part I.—Agri.
    Part II.—Animal Husbandry in India.
11. AGRICULTURE AND LIVE-STOCK IN INDIA. Vol. 1. (1931 —).
12. ALLAHABAD FARMER. Vol. 4. (1930 —).
13. BERICHTE DES O.—HARA INSTITUT FUR LANDWIRTS CHAFTLICHE. Vol. 5. (1931 —).
14. BULLETINUL CULTIVAREI SI FERMANTAREI TUTUNULUI. (Bulletin de l' Institute Experimental pour la culture et la fermentation du tabac) (Rumania). Vol. 21 (1932 —).
15. BULLETIN OF CENTRAL EXPERIMENT STATION (Russia). Vol. 1. (1934 —).
16. BULLETIN OF MIYAZAKI COLLEGE OF AGRICULTURE AND FORESTRY. (1931 —).
17. BULLETIN OF THE IMPERIAL INSTITUTE, London. Vol. 1. (1903 - -).
18. CROP REPORTS (NATIONAL AGRICULTURAL RESEARCH BUREAU, CHINA). Vol. 3. (1935 —).
19. CYPRUS AGRICULTURAL JOURNAL. Vol. 25. (1930 —).
20. EAST AFRICAN AGRICULTURAL JOURNAL. (Nairobi). Vol. 1. (1935 —).
21. EMPIRE JOURNAL OF EXPERIMENTAL AGRICULTURE. (England). Vol. 1. (1933 —).
22. EXPERIMENT STATION RECORD. (U. S. Department of Agriculture). Vol. 1 -19, 21, 27 and 62. (1930 —).
23. FARMER (Natal). Vol. 23. (1935—).
24. FARMING IN SOUTH AFRICA (Pretoria). Vol. 8 (1933 —).
25. GARDENING REVIEW (Madras). (1934 —).
26. GARDENS BULLETIN (Straits Settlements). Vol. 8. (1934 —).
27. GIORNALE DI RISICOLTURA (Italy). Vol. 20. (1930 —).
28. HILGARDIA (JOURNAL OF AGRICULTURAL SCIENCE.) (Berkley). Vol. 7. (1933 —).
29. HORTICULTURAL ABSTRACTS (I. B. of F. Production). Vol. 1. (1931 —).
30. HYDERABAD FARMER. Vol. 1. (1931 —).
31. INTERNATIONAL REVIEW OF AGRICULTURE. (Rome). Vol. 23. (1932 —).
32. JOURNAL OF AGRICULTURAL RESEARCH. (U. S. A.) Vol. 41. (1930 —).
33. JOURNAL OF AGRICULTURAL SCIENCE. (England). Vol. I. (1905 —).
34. JOURNAL OF AGRICULTURE OF THE UNIVERSITY OF PUERTO RICO. (Rio Predras) Vol. 16 and 18. (1934 --).
35. JOURNAL OF THE AMERICAN SOCIETY OF AGRONOMY. (New York). Vol. 21. (1929 —).
36. JOURNAL OF THE COLLEGE OF AGRICULTURE. (Tokyo).

37. JOURNAL OF THE DEPARTMENT OF AGRICULTURE. (Victoria). Vol. 34. (1934 —).
38. JOURNAL OF THE MINISTRY OF AGRICULTURE. (London). Vol. 6. (1899-1900 —).
39. JOURNAL OF THE RUBBER RESEARCH INSTITUTE. (Malaya). Vol. I. (1929 —).
40. JOURNAL OF THE SOUTH EASTERN AGRICULTURAL COLLEGE. (Wye, Kent. (1907 —).
41. KISAN (Patna). Vol. 1. (1933 —).
42. MADRAS AGRICULTURAL JOURNAL. Vol. 19. (1930 —).
43. MALAYAN AGRICULTURAL JOURNAL. Vol. 18. (1930 —).
44. MALAYAN AGRI-HORTICULTURAL ASSOCIATION MAGAZINE. Vol. 3. (1933 —).
45. MONTHLY BULLETIN OF AGRICULTURAL ECONOMICS AND SOCIOLOGY (International Institute of Agriculture, Rome). Vol. 1. (1910—).
46. MONTHLY BULLETIN OF AGRICULTURAL SCIENCE AND PRACTICE. (International Institute of Agriculture, Rome). Vol. 1. (1910 —).
47. MONTHLY CROP REPORT AND AGRICULTURAL STATISTICS. (International Institute of Agriculture, Rome). Vol. 1. (1910 —).
48. NEW LAND JOURNAL OF AGRICULTURE. Vol. 40. (1930 —).
49. PHILIPPINE JOURNAL OF AGRICULTURE, MANILA. Vol. 2. (1931 —).
50. PLANT INDUSTRY IN U. S. S. R. (Russia). (1934 —).
51. PLANTERS CHRONICLE. (Coonoor, Madras). (1934 —).
52. PLANTERS JOURNAL AND AGRICULTURIST. (Calcutta). (1935 —).
53. REVIEW OF AGRICULTURAL OPERATION IN INDIA. (1919 to 1932-33). (Continued as "Agriculture and Animal Husbandry in India" 2 parts).
54. RHODESIA AGRICULTURAL JOURNAL. (1934 —).
55. SEASONAL NOTES (Punjab Agricultural Department), Vol. 7. (1930 —).
56. TASMANIAN JOURNAL OF AGRICULTURE. Vol. 1. (1930 —).
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85. BIOLOGICAL REVIEWS. (England). Vol. 7. (1932 —).
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95. BULLETIN DU JARDIN BOTANIQUE. (Buitenzorg). Vol. 1. (1919 —).
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    (*ii*) Publications relating to soils and fertilizers No. 1. (1932 —).
    (*iii*) Technical Communications. No. 1. (1929 —).
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APPENDIX VIII.

Annual Accounts for the year 1936-37 relating to the grant for research purposes.

RECEIPTS.

Head of account.	Receipts during the year.	Remarks.
	Rs. a. p.	
1. Opening balance on 1st April 1936	8,128 5 6	
2. (*i*) Annual recurring grant from the Government of India for research work.	5,00,000 0 0	
(*ii*) Grant from Government of India for research work connected with the promotion of sugar Industry.	1,75,000 0 0	
(*iii*) Grant for Marketing scheme (Provincial Portion).	2,00,000 0 0	
(*iv*) Balance of initial lump grant	10,00,000 0 0	
(*v*) Special grant from the Government of India for research work.	14,36,476 0 0	
3. Donation from Indian States—		
(*i*) Baroda . . 5,000		
(*ii*) Cochin . . 5,000		
(*iii*) Travancore . 5,000	22,500 0 0	
(*iv*) Bhopal . 2,500		
(*v*) Kashmir . . 5,000		
4. Interest from investments, etc.—		
(*a*) Interest from 5 per cent. loan of 1939-44.	77,525 8 0	
(*b*) Interest from fixed deposits	20,972 6 0	
(*c*) Interest from 2½ per cent loan of 1948-52 and 3½ per cent loan of 1947-50.	15,087 2 0	
5. Receipts from Sugar Cables Service.	2,540 14 6	
6. Receipts on account of fees from professional advice given by the Sugar Technologist to the Council to Sugar factories.	3,087 9 6	

PAYMENTS.

Head of account.	Grants. Original.	Grants. Net.	Expenditure during the year.	Excess— or saving + over net grant.	Remarks.
	Rs.	Rs.	Rs. a. p.	Rs. a. p.	
1. Establishment of Research and Testing Station for the indigenous system of gur manufacture by the Director, Imperial Institute of Sugar Technology.	27,800	21,150	21,369 0 6	—219 0 6	Inconsiderable.
2. Sugar Committee	2,000	2,230	2,211 15 0	+18 1 0	,,
3. Manufacture of Cattle feed from molasses.	7,000	800	784 5 0	+15 11 0	,,
4. Sugar Technologist—					
(*a*) Main Office	31,500	29,900	29,846 2 0	+53 14 0	,,
(*b*) Sugar Cable Service . . .	4,820	3,600	3,589 3 9	+10 12 3	,,
(*c*) Bureau of Sugar Standards . .	6,400	4,850	4,831 10 9	+18 5 3	,,
(*d*) Indian Sugar Trade Information Service.	2,500	2,500	2,536 0 6	—36 0 6	,,
5. Appointment of the Chief Economist and Staff in connection with the investigations into the cost of production of crops in the principal sugarcane and cotton tracts in India.	16,000	26,050	26,054 7 9	—4 7 9	,,
6. Investigations into the cost of production of crops in the principal sugarcane and cotton tracts in India—					
(*a*) (*i*) Madras :	7,500	7,500	7,500 0 0	...	
(*ii*) Bombay	9,500	7,750	7,750 0 0	...	
(*iii*) Punjab :	9,600	9,800	9,774 9 3	+25 6 9	,,
(*iv*) Bihar	10,600	9,600	9,600 0 0	...	
(*v*) Bengal	7,600	7,400	7,400 0 0	...	
(*vi*) United Provinces . . .	8,400	7,550	7,531 12 9	+18 3 3	,,
(*vii*) Central Provinces and Berar .	6,400	5,870	5,867 9 3	+2 6 9	,,
(*viii*) Hyderabad	1,000	520	515 0 0	+5 0 0	,,
(*ix*) Mysore	2,300	2,360	2,356 13 6	+3 2 6	,,
(*x*) Baroda	2,300	1,310	1,310 0 0	...	
(*xi*) Sind	2,300	2,710	2,705 0 0	+5 0 0	,,
(*b*) Cost on account of remuneration for checking the data.	3,200	2,450	2,450 0 0	...	

7. Receipts from Sugar Trade Information Service.	480	0	0	20,000	10,000	7. Grant to the Harcourt Butler Technological Institute.	10,000	0	0	...	
8. Receipts on account of admission to the Harcourt Butler Technological Institute.	1,047	8	0	20,000	19,380	8. Grant for research on Mosaic, and other cane diseases, at New Delhi.	19,380	0	0	...	
9. Receipts of the Bureau of Sugar Standards.	2,139	13	9	52,000	26,000	9. Establishment of Sugarcane Station in Bihar, and appointment of a Sugarcane Specialist.	26,000	0	0	...	
10. Receipts from the Empire Marketing Board in respect of Moiety of expenditure payable for the Bengal and Burma rice schemes.	25,300	10	0	36,700	14,250	10. Establishment of a Sub-Station of the Coimbatore Imperial Station at Karnal.	14,250	0	0	...	
				4,000	3,320	11. Grant to Government of Mysore for breeding of thick canes in Mysore.	3,320	0	0	...	
11. Receipts from the Indian Central Cotton Committee in respect of moiety of expenditure payable for the "Scheme of Investigation into the Cost of Production of Crops in the Principal Sugarcane and Cotton tracts in India".	43,000	0	0	4,400	2,070	12. Sugarcane seedling testing station at Dacca.	2,070	0	0	...	
				65,400	54,400	13. Sugarcane Research Station in the Bombay—Deccan.:	54,400	0	0	...	
				8,100	7,500	14. Research on the genetics of sugarcane at the Imperial Cane Breeding Station, Coimbatore.	7,502	6	0	—2 6 0	,,
12. Receipts realised from various Schemes financed by the Council	12,571	10	9	20,800	18,900	15. Research on Sugarcane in the Madras Presidency.	18,885	0	5	+14 15 7	,,
13. Other Miscellaneous receipts .	308	5	3	25,000	22,050	16. Scheme for the establishment of sugarcane Research Station in the Punjab.	22,050	0	0	...	
14. Repayment of motor car advance by the Statistician.	148	0	0	17,100	17,100	17. Investigation into various problems of Sugar Industry in the U. P.	17,100	0	0	...	
15. Deposits and Advances . .	2,040	6	0	7,000	8,950	18. Extension of sugarcane work at the Jorhat Experimental Station, Assam.	8,950	0	0	...	
16. Recoveries on account of General Provident Fund and Income-Tax.	11,362	2	0	2,500	1,640	19. Research on Structural Anatomy of Sugarcane by Dr. Ekambaram.	1,640	0	0	...	
				1,500	1,500	20. Grant to Bihar and Orissa Government for investigation into manufacture of Khandsari sugar.	1,445	0	0	+5 0 0	,,
				8,400	...	21. Chemistry of Sugarcane . . .	...			...	
				3,600	1,500	22. Scheme for the investigation of suitable types of sugarcane in Gujarat by Baroda Durbar.	1,500	0	0	...	
				19,400	...	23. Sugarcane scheme in the North-West Frontier Province.	...			...	
				44,800	10,840	24. Central Sugarcane Insect Pest Scheme	10,840	0	0	...	
				3,100	3,000	25. Sugarcane seedling scheme in the United Provinces.	3,000	0	0	...	
				...	5,320	26. Grant to Sugar Demonstration Section of the U. P. Industrial and Agricultural Exhibition.	5,315	0	0	+5 0 0	,,
				...	1,000	27. Utilization of bagasse for paper and board industry.	1,000	0	0	...	
				...	3,100	28. Deputation of Mr. P. V. Isaac .	3,096	10	0	+3 6 0	,,
Total Receipts . .	32,59,725	5	3								
Receipts of investments and re-investments from fixed deposits and Treasury bills.	16,80,000	0	0								
GRAND TOTAL .	49,39,725	5	3								

RECEIPTS. PAYMENTS.

Head of account.	Receipts during the year.	Remarks.	Grants. Original.	Grants. Net.	Head of Account.	Expenditure during the year.	Excess— or saving + over net grant.	Remarks.
	Rs. a. p.		Rs.	Rs.		Rs. a. p.	Rs. a. p.	
			74,300	81,600	29. Special staff for research work on locust control measures.	82,344 10 6	—744 10 6	Inconsiderable.
			1,000	...	30. Locust Committee . . .	...	...	
			1,000	800	31. Central Locust Bureau . .	798 6 0	+1 10 0	,,
			1,000	...	32. Fertilizers Committee . . .	...	...	
			18,000	18,700	33. Statistical Section of the Bureau of Agricultural Intelligence. :	18,678 0 9	+21 15 3	,,
			2,000	380	34. Indian Oilseeds Crushing Industry Committee.	376 10 9	+3 5 3	,,
			1,000	...	35. Award of a prize for a bone crusher worked (*a*) by animal power (*b*) by mechanical power.	...	...	
			...	1,830	36. Marketing Scheme at Headquarters	1,824 0 0	+6 0 0	,,
			2,00,000	1,87,700	37. Marketing Scheme (Provincial portion)	1,87,705 0 0	—5 0 0	,,
			25,300	24,170	38. Botanical Sub-Station at Karnal .	24,170 0 0	...	
			23,100	23,100	39. Agricultural Meteorology, Poona .	23,100 0 0	...	
			6,200	5,470	40. Grant to the Government of Punjab for locust control measures.	5,470 0 0	...	
			3,900	3,900	41. Appointment of Physical Assistant on the staff of the Agricultural Chemist, Bengal.	3,850 0 0	+50 0 0	,,
			47,000	37,120	42. Grant to Principal Agra College for investigation of rusts of wheat and barley.	37,112 0 0	+8 0 0	,,
					43. Co-ordinated schemes of rice research :—			
			27,300	27,000	(*i*) Burma	27,000 0 0	...	
			18,100	16,000	(*ii*) Central Provinces . . .	16,000 0 0	...	
			33,800	33,600	(*iii*) Bihar and Orissa . . .	33,600 0 0	...	
			19,600	28,400	(*iv*) Assam	28,384 4 9	+15 11 3	,,
			24,500	22,320	(*v*) United Provinces . . .	22,321 4 0	—1 4 0	,,
			19,700	22,800	(*vi*) Madras	22,794 4 6	+5 11 6	,,
			23,000	23,000	(*vii*) Bengal	23,050 0 0	—50 0 0	,,
			4,400	4,300	44. Research work on potatoes in Madras	4,312 0 0	—12 0 0	,,
			7,500	7,600	45. Scheme for potatoe breeding in Northern India.	7,599 11 9	+0 4 3	,,
					46. Provincial schemes of Fruit Research—			
			17,000	17,500	(*i*) Bombay	17,500 0 0	...	
			11,000	7,830	(*ii*) Madras	7,820 0 0	+10 0 0	,
			7,600	7,900	(*iii*) Bengal	7,900 0 0	...	
			14,000	20,050	(*iv*) Bihar	20,046 1 1	+3 14 11	,,
			3,700	3,800	(*v*) Punjab . . .	3,800 0 0	...	

7,400	...	(vi) Assam	...			...		
14,200	4,000	(vii) Central Provinces	4,000	0	0	...		
19,900	4,000	(viii) Punjab (Citrus stock and grape vines).	4,000	0	0	...		
5,400	...	(ix) North-West Frontier Province	...			...		
4,260	...	(x) Mysore	...			...		
3,300	...	(xi) Hyderabad	...			...		
16,000	...	(xii) Quetta	...			...		
26,400	26,400	(xiii) United Provinces	26,400	0	0	—60	0	0 „
		47. Dry Farming Research Scheme—						
39,800	30,100	(i) Bombay Deccan	30,100	0	0	...		
19,700	18,400	(ii) Ceded Districts of Madras	18,400	0	0	...		
21,700	22,800	(iii) South East Punjab	22,800	0	0	...		
10,200	10,200	(iv) Hyderabad	2,500	0	0	+7,700	0	0 Considerable.
11,000	9,200	48. Scheme for the improvement of castor crop in India.	9,180	0	0	+20	0	0 Inconsiderable.
30,000	30,000	49. Financial Assistance to oil Technological section of Harcourt Butler Technological Institute.	30,000	0	0	...		
		50. Malting and brewing tests of improved barleys—						
1,600	750	(i) United Provinces	750	0	0	...		
4,500	...	(ii) Punjab	...			...		
1,200	...	(iii) Bihar	...			...		
3,500	4,400	51. Chemistry of Malting Cholam in Madras.	4,400	0	0	...		
11,800	11,650	52. Research in systematic cultivation of medicinal plants and study of food poisons by Colonel Chopra.	11,634	4	6	+15	11	6
6,000	7,200	53. Grant for tobacco Co-operative experiments.	7,180	0	0	+20	0	0
1,800	4,500	54. Investigation of Indian fish poisons and other forest products for their insecticidal properties in Mysore.	4,500	0	0	...		
20,200	22,800	55. Tobacco research at Guntur sub-station.	22,780	0	0	+20	0	0
		56. Oilseed research schemes in provinces—						
10,400	830	(i) Linseed in Central Provinces	830	0	0	...		
4,200	2,860	(ii) Linseed in Bengal	2,860	0	0	...		
7,000	4,260	(iii) Rape and Mustard seeds in Punjab.	4,260	0	0	...		
11,400	5,390	(iv) Groundnuts in Madras	5,390	0	0	...		
7,300	...	57. San Jose Scale Survey in the Punjab and North-West Frontier Province.	...			...		
22,300	...	58. Equipment of a wheat milling and baking laboratory at Lyallpur.	...			...		
3,000	...	59. Research on the microflora of kallar and alcaline soils in the Punjab.	...			...		
4,250	4,000	60. Research on the diseases of the coconut palm in Southern India (Travancore).	4,000	0	0	...		

RECEIPTS. PAYMENTS.

Head of account.	Receipts during the year. Remarks.	Grants. Original.	Grants. Net.	Head of account.	Expenditure during the year.	Excess — or saving + over net grant.	Remarks.
	Rs. a. p.	Rs.	Rs.		Rs. a. p.	Rs. a. p.	
		5,000	...	61. Research on the cytology of Indian crop plants.	...	...	
		19,000	1,000	62. Research on the virus diseases of plants in Bombay.	995 11 0	+4 5 0	Inconsiderable.
		1,800	1,200	63. Bengal flax fibre scheme . . .	1,200 0 0	...	
		3,000	2,000	64. Research on the gangai pest of rice in the Central Provinces.	1,986 0 0	+14 0 0	,,
				65. Sunn hemp schemes in provinces—			
		500	...	(i) Madras	...	...	
		1,500	1,350	(ii) Central Provinces . . .	1,350 0 0	...	
		240	...	(iii) Bihar	...	...	
		500	...	(iv) Bombay	...	...	
		2,000	...	66. United Provinces scheme for the supply of decorticated cotton seed cake for propaganda.	...	...	
		...	2,120	67. Gas storage of fruit and vegetables, Bombay.	2,120 0 0	...	
		10,800	11,000	68. Scheme of Agricultural Research at Dacca University.	11,000 0 0	...	
		6,800	6,600	69. Scheme of research into the properties of colloid soil constituents by Professor Mukerjee.	6,600 0 0	...	
		7,200	7,620	70. Investigation on experimental error in field trials by Prof. Mahalanobis.	7,620 0 0	...	
		2,000	3,200	71. Investigation on the organic constituents of Indian soils by Professor J. C. Ghosh.	3,200 0 0	...	
		3,200	1,800	72. Extension of work on quality in crops at the Indian Institute of Science, Bangalore.	1,800 0 0	...	
		1,000	1,130	73. Prof. J. B. Seth's scheme for investigating an electric method of hygrometry (Punjab).	1,130 0 0	...	
		4,600	1,700	74. Investigation for preparation of cheap synthetic manures from town refuse and waste materials at the Indian Institute of Science.	1,700 0 0	...	
		2,350	1,750	75. Research on loss and fixation of nitrogen in soils by Dr. N. R. Dhar.	1,750 0 0	...	
		20,000	...	76. Scheme of Plant physiology at the Benares Hindu University.	...	...	

...	500	77. Research in Agricultural Economics at the Gokhale Institute of Politics and Economics.	500 0 0	...		
...	2,430	78. Research work in plant physiology by Dr. Bosi Sen.	2,425 0 0	+5 0 0	Inconsiderable.	
12,900	15,400	79. Appointment of a physiological chemist to study animal nutrition problems at Dacca.	15,400 0 0	...		
1,500	8,170	80. Dr. Slater's scheme of goat breeding	8,170 0 0	...		
		81. Appointment of Veterinary Investigation Officers in Provinces—				
10,200	7,650	(i) Hyderabad	7,650 0 0	...		
10,000	9,200	(ii) Bombay :	9,200 0 0	...		
11,000	9,400	(iii) Bengal	9,400 0 0	...		
10,000	9,800	(iv) Punjab	9,800 0 0	...		
10,200	8,950	(v) Bihar	8,950 0 0	...		
9,400	9,070	(vi) Central Provinces . .	9,070 0 0	...		
8,200	11,850	(vii) Madras	11,842 0 0	+8 0 0	,,	
9,000	8,600	(viii) United Provinces . . .	8,600 0 0	...		
8,900	7,950	(ix) Assam . . .	7,950 0 0	...		
6,000	6,600	(x) North West Frontier Province	6,600 0 0	...		
6,600	3,300	82. Scheme regarding investigation into the more suitable and economic methods of combating different types of parasitic infection in ruminants in the fields.	3,300 0 0	...		
8,700	8,700	83. Extension of work on Animal Nutrition in Madras Presidency	8,650 0 0	+50 0 0	,,	
6,800	7,300	84. Investigation of Johne's diseases among cattle in Mysore.	7,300 0 0	...		
1,000	...	85. Dairy Legislation	...	...		
14,600	14,900	86. Investigation for vaccination of cattle against rinderpest in the Central Provinces.	14,900 0 0	...		
2,000	2,000	87. Grant to Government of Punjab for training of an Assistant in Apiculture in America and other countries.	2,000 0 0	...		
1,400	700	88. Grant to Mr. Varma for special study of dairy technology in England.	687 15 0	+12 1 0	,,	
7,400	4,000	89. Appointment of a protozoologist at the Imperial Veterinary Research Institute, Muktesar.	4,000 0 0	...		
36,000	3,250	90. Research at the Anand Creamery in the manufacture of products and bye-products of milk.	3,232 3 7	+17 12 5	,,	
40,000	...	91. Investigation of Tuberculosis and Johne's disease at the Imperial Veterinary Research Institute, Muktesar.	...	...		
28,800	...	92. Investigation into contageous abortion in cattle.	...	...		
40,400	10,400	93. Feeding of cattle on departmental farms in the United Provinces.	10,400 0 0	...		

RECEIPTS. PAYMENTS

Head of account.	Receipts during the year.	Remarks.	Grants. Original.	Grants. Net.	Head of account.	Expenditure during the year.	Excess — or saving + over net grant.	Remarks.
	Rs. a. p.		Rs.	Rs.		Rs. a. p.	Rs. a. p.	
			4,300	4,200	94. Investigation of indigenous sheep-breeding, Punjab.	4,200 0 0	...	
			8,000	18,200	95. Scheme of Poultry Husbandry in Bombay.	18,170 0 0	+30 0 0	Inconsiderable.
			1,100	1,100	96. Research on fresh water fishes of Bengal.	1,100 0 0	...	
			13,200	...	97. Research in the diseases of poultry in Bengal Presidency.	...	...	
			5,000	...	98. Feeding of minerals to cattle in Bihar.	...	...	
			1,240	...	99. Improvement of poultry for table purposes in Punjab.	...	...	
			3,820	...	100. Bombay sheep breeding scheme	...	...	
			1,500	...	101. Enquiry into the Helminthiasis of cattle sheep and goats in the United Provinces.	...	...	
			4,300	3,170	102. Research on composition of milk at the Allahabad agricultural institute.	3,170 0 0	...	
			650	500	103. Research on warble flies . . .	500 0 0	...	
			...	24,300	104. Village Enquiry regarding cattle and production and consumption of milk.	24,287 15 0	+12 1 0	„
			5,000	5,900	105. All India Animal Husbandry Bureau	5,888 7 3	+11 8 9	„
			...	1,450	106. Establishment of pedigree herd books	1,450 0 0	...	
			200	260	107. Participation of India at the Imperial Botanical Conference.	258 5 0	+1 11 0	„
			1,000	780	108. Participation of India at the sixth poultry congress Leipzig.	678 12 0	+1 4 0	„
			...	230	109. Participation of India at the third International Soil Science Congress.	227 13 0	+2 3 0	„
			2,400	1,340	110. Contribution to International Office of Epizootics, Paris.	1,335 2 0	+4 14 0	„
			13,000	14,100	111. Contribution to International Institute of Agriculture, Rome.	14,076 2 7	+23 13 5	„
			2,600	5,340	112. Contribution to Imperial Institute of Entomology.	5,333 5 0	+6 11 0	„
			300	...	113. Contribution to the Tobacco Federation of the British Empire.	...	...	
			8,000	8,000	114. Contribution to Imperial Mycological Institute, London.	8,000 0 0	...	
			29,200	29,200	115. Contribution to Imperial Agricultural Bureau, London.	29,166 10 8	+33 5 4	„

8,800	8,800	116.	Contribution to Laboratory at Farnham House and investigations at slough.	8,750	8	0	+49	8	0	,,
500	500	117.	Contribution to Indian academy of Sciences, Bangalore.	500	0	0	...			
500	500	118.	Contribution to National Institute of Sciences, Calcutta.	500	0	0	...			
1,300	1,300	119.	Contribution to Edinburgh University	1,333	5	0	—33	5	0	,,
670	670	120.	Contribution to Royal Veterinary College, London.	666	10	8	+3	5	4	,,
...	140	121.	Contribution to the Coffee Section of the British Empire Organisation.	140	0	0	...			
...	500	122.	Contribution to the National Academy of Science, Allahabad.	500	0	0	...			
7,000	5,900	123.	Books and Publications . . .	5,894	13	10	+5	2	2	,,
9,500	8,960	124.	Accounts and Audit . . .	8,959	3	9	+0	12	3	,,
9,000	9,000	125.	Travelling allowance of non-official members.	9,047	2	0	—47	2	0	,,
6,000	10,300	126.	Travelling allowance of visitors .	10,286	11	0	+13	5	0	,,
1,000	650	127.	Editorial Committee . . .	649	5	0	+0	11	0	,,
500	1,250	128.	Miscellaneous	1,229	8	3	+20	7	9	,,
...	450	129.	Award of medals for improvement in agricultural and animal husbandry.	453	0	0	—3	0	0	,,
98,000	77,100	130.	Review of research programme of the Council.	77,398	3	9	—298	3	9	,,
2,000	2,660	131.	Loans and advances to Council's Servants (motor car advance to statistician).	2,660	0	0	...			
3,000	3,900	132.	Deposits and advances repayable .	1,230	0	0	+2,670	0	0	Considerable.
2,500	13,700	133.	Remittances of income tax, provident funds, etc.	13,665	4	0	+4	12	0	Inconsiderable.
			Total Expenditure . .	17,06,393	6	4				
			Investments and reinvestments in fixed deposits.— (i) Principal, ... 31,30,000-0-0. (ii) Premium paid on purchase of 2½ per cent. loan 1948-52 and 3½ per cent. loan 1947-50 ... 44,231-10-0.	31,74,231	10	0				
			By balance	59,100	4	11				
			Grand Total . .	49,39,725	5	3				
Grant Total .	49,39,725	5	3							

I. Particulars of Advances outstanding at the end of the year—

Particulars.	Amount. Rs. a. p.
1. Permanent advance with the Locust Research Entomologist, Karachi	1,500 0 0
2. Permanent advance with the Sugar Technologist, Cawnpore	200 0 0
3. Permanent advance with the Secretary, Imperial Council of Agricultural Research	250 0 0
4. Permanent advance with the Librarian, Imperial Council of Agricultural Research	10 0 0
Total	1,960 0 0

III. Particulars of Securities, etc.—

	Face value. Rs.	Purchase value. Rs.	(Approximate market value on 7th April 1937 as no quotation is available for 31st March 1937).
1. 5 per cent. loan of 1939-44 (Stock certificates kept with the Reserve Bank of India, Calcutta)	15,54,400	14,99,995 0 0	Rs. 16,43,778 (at Rs. 105-12-0 for Rs. 100).
2. 3½ per cent. loan 1947-50 (kept with the Reserve Bank of India, Calcutta)	5,50,000	5,91,495 1 0	Rs. 5,77,500 (at Rs. 105 for Rs. 100).
3. 2¾ per cent. loan 1948-52 (kept with the Reserve Bank of India, Calcutta)	4,00,000	4,02,736 9 0	Rs. 3,97,500 (at Rs. 99 3/8 for Rs. 100).
4. Five fixed deposit receipts Nos. 3667—3671 dated 8th July 1936 for one year at 1½ per cent. for Rs. one Lakh each	5,00,000	5,00,000 0 0	
5. Five fixed deposit receipts Nos. 3771—3775 dated 25th January 1937 for one year at 1½ per cent. for Rs. 50,000 each	2,50,000	2,50,000 0 0	
6. Fourteen fixed deposit receipts Nos. 3809—3822 dated 6th April 1937 bearing interest at ½ per cent. and repayable at a week's notice for Rs. 50,000 each	7,00,000	7,00,000 0 0	
(NOTE.—The Imperial Bank of India were asked to invest the amount on 30th March 1937 but actual transaction took place on 6th April 1937).			
7. Ten five year post office cash certificates, dated 25th September 1935 of the face value of Rs. 1,000 each	10,000	8,625 0 0	

IV. Particulars of closing balance—

	Rs. a. p.
1. Cash in hand with the Secretary of the Council	40 3 0
2. Cash in current account with the Imperial Bank of India, Simla	59,060 1 11
Total	59,100 4 11

N. C. MEHTA,
Secretary,
Imperial Council of Agricultural Research.

The accounts have been examined and according to the best of my information, as a result of a test-audit of the books of the Imperial Council of Agricultural Research and consideration of the explanation given, the accounts are correct, subject to the remarks made in my report of 15th June 1937.

H. K. MALICK,
Examiner,
Outside Audit Department.

APPENDIX IX.

List of Scientific and Technical Officers paid from the research grant of the Imperial Council of Agricultural Research as on 31st March 1937.

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
Sugar Technology, Imperial Council of Agricultural Research, Cawnpore.					
1. Office of Sugar Technologist .	Sugar Technologist . .	Mr. R. C. Srivastava, M.Sc. (Allahabad), B.Sc. (Tech.) Manchester.	4th July 1930 .	On deputation from the United Provinces Government.	Transferred as First Director of the Imperial Institute of Sugar Technology with effect from 1st October 1936.
	Temporary Technical Assistant.	Mr. S. N. Gundurao, B.Sc. Assoc. H. B. T. I.	20th October 1934	By Selection.	Transferred to the Imperial Institute of Sugar Technology with effect from 1st October 1936.
2. Sugar Research and Testing Station (Bilari).	Sugar Research Chemist* .	...	...	.....	*Post vacant.
	Sugar Engineer . .	Mr. J. Prasad, B.Sc. (Eng.), Dip. R.T.C. (Glas) M. Inst., B.E.	13th November 1936.	Through the Public Service Commission (India).	
3. Bureau of Sugar Standards .	Chemist . . .	Mr. N. C. Verma, B.Sc. Assoc. H.B.T.I.	11th March 1935	By selection.	
Locust Research Scheme, I. C. A. R.	Locust Research Entomologist to the Imperial Council of Agricultural Research, Karachi.	Rao Bahadur Y. Ramchandra Rao, M.A., F.R.E.S.	13th December 1930.	On foreign service, lent by the Madras Agriculture Department.	
	Assistant Entomologist, Pasni.	Dr. M. L. Roonwal, Ph.D. .	6th November 1935.	Direct appointment.	
	Assistant Entomologist, Karachi.	Dr. S. Mukerji, D.Sc. . .	10th January 1936.	Direct appointment.	
	Locust Research Assistant, Barmar.	Mr. Des Raj Bhatia, M.Sc. .	2nd January 1931.	Through the Public Service Commission (India).	
	Locust Research Assistant, Pasni.	Mr. S. M. Taqi Ahsan, M.Sc.	28th March 1934	Direct appointment.	
	Locust Research Assistant, Ambagh.	Mr. R. N. Batra, M.Sc. . .	27th May 1935 .	Direct appointment.	
	Mekran Survey Assistant, Pasni.	Mr. Rashid Ahmed, B.Sc. Hons.	23rd August 1935	Direct appointment.	
	Biometrical Assistant, Karachi.	Mr. Ram Lal Gupta, M.Sc. .	10th October 1936	Direct appointment.	

Name of Scheme	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
Statistical—Field Experiment .	Statistician . . .	Rao Bahadur M. Vaidyanathan, M.A. L.T.	6th July 1930 .	Through the Public Service Commission (India).	
	Statistical Assistant . .	Mr. S. Subramania Iyer, M.A.	5th June 1933 .	Through the Public Service Commission (India).	
	Agricultural Assistant .	Mr. T. Krishna Murthy, B.Sc. (Ag.).	11th February 1935.	Through the Public Service Commission (India).	
Cost of Production . . .	Chief Economist . .	Mr. R. D. Kapur, M.A., B.Sc.	18th July 1932 .	Through the Public Service Commission (India).	
Imperial Agricultural Research Institute, New Delhi.					
1. Botanical Sub-Station, Pusa	1. Superintendent . .	Mr. R. D. Bose, B.Sc.. .	15th May 1936. .	By transfer from the Botanical section of the Institute.	
	2. Assistant . . .	Shaikh Mohd. Umar, M.Sc .	1st August 1936 .	By transfer from the Botanical section of the Institute.	
2. Sugarcane Sub-Station, Karnal.	1. Superintendent . .	Mr. G. V. James . .	16th April 1931 .	By promotion from the Department.	
	2. Technical Assistant .	Mr. T. R. Venkatraman, B.A.	2nd October 1936	By promotion from the Department.	
3. Scheme for research into Mosaic and other diseases of sugarcane, New Delhi.	1. Plant Pathologist .	Dr. B. L. Chona . .	23rd March 1936	Through the Public Service Commission (India).	
	2. Assistant Sugarcane Mycologist.	Mr. L. S. Subramanium .	23rd June 1933 .	Through the Public Service Commission (India).	
	3. Research Assistant .	Mr. S. A. Rafay, M.Sc. .	17th October 1932.	Through the Public Service Commission (India).	
4. Scheme for research on Genetics of Sugarcane at the Imperial Cane Breeding Station, Coimbatore.	1. Geneticist . . .	E. K. Janaki Ammal, M.A., M.Sc., D.Sc.	26th May 1934 .	Through the Public Service Commission (India).	
5. Scheme for Potato breeding in Northern India.	1. Assistant . . .	Mr. Pushkarnath, M.Sc. .	1st April 1935 .	By selection from postgraduate students at Pusa.	
	2. Assistant . . .	Mr. M. L. Khanna, B.Sc. .	1st August 1936 .	By selection from the list of candidates recommended by Principals of Agricultural Colleges.	
6. Tobacco Research Substation, Guntur.	1. Superintendent . .	Mr. Ch. V. Sarvaya, B.Sc.	7th August 1936	By transfer from the Madras Agri. Department after inviting applications by advertisement.	
	2. Assistant Entomologist	Mr. C. K. Samuel, B.Sc. .	10th August 1936	By transfer from the Entomological Section of the Institute after inviting applications by advertisement.	

7. Scheme for Research on Insect Pests of Sugarcane.	1. Assistant . . .	Mr. T. V. Venkatraman, M.Sc.	27th August 1936	Selected from the applications received for the posts of Assistants which had been advertised.
	2. Assistant . . .	Mr. K. V. Rao., B.Sc. Assoc. I.A.R.I.	4th September 1936.	Selected from the applications received for the posts of Assistants which had been advertised.
	3. Assistant . . .	Mr. Md. Abdul Hakim Bhuya, B.Sc. (Aligarh), M.Sc. (Calcutta), Research Scholar to the Government of Bengal.	1st March 1937 .	Selected from the applications received for the post of Assistant Entomologist which had been advertised.
	4. Assistant . . .	Mr. K. Lakshmanan, B.Sc. (Ag.).	1st March 1937 .	Selected from the applications received for the posts of assistants which had been advertised. Appointed as Fieldman from 2nd September 1936 and promoted to the post of Assistant from 1st March 1937.

MADRAS.

Agricultural Schemes.

1. Rice Research Station, Ganjam.	Superintendent, Rice Research Station, Berhampore.	Mr. Samuel Jobitha Raj, B.A. (Zoology and Botany).	27th March 1932	Promoted from the Madras Agricultural Subordinate Service Class I—Upper Subordinates.
	Assistant . . .	Mr. M. B. Venkatanarasinga Rao. B.A. (Mathematics and Physics). B.Sc. Ag. underwent post-graduate course in plant genetics at Pusa.	11th April 1932 .	Transferred from the Department.
	Assistant . . .	Mr. K. B. Viswanathan, B.Sc. Ag.	1st May 1932 .	Transferred from the Department.
	Assistant . . .	Mr. P. Somayajulu, B.Sc. Ag.	15th December 1933.	Recruited through the Madras Service Commission.
2. Investigation into the quality of rice.	Assistant . . .	Mr. C. Rajasekara Mudaliar, M.A.	14th October 1935	Transferred from the Department.
3. Research on Potatoes in the Madras Presidency.	Superintendent, Agl. Research Station, Nanjanad.	Mr. V. K. Subramanaya Mudaliyar, L.Ag.	13th June 1933 .	Promoted from the Madras Agricultural Subordinate Service Class I—Upper Subordinates.
4. (*a*) Sugarcane Research, Anakapalli.	Farm Manager . .	Mr. I. Sambasiva Rao, B.Sc. Ag.	19th June 1935 .	Transferred from the Department.
	Botany Assistant. .	...	...	Vacant from 10th October 1936.
(*b*) Sugarcane Research, Gudiyattam.	Farm Manager . .	Mr. R. Vasudeva Rao, L.Ag., underwent post-graduate course in plant genetics at Pusa.	29th April 1933 .	Transferred from the Department.
	Botany Assistant . .	Mr. S. Ramaswami Ayyar, B.Sc. Ag.	11th May 1933 . .	Transferred from the Department.

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
Agricultural Schemes—contd.	Farm Manager : . .	Mr. C. Ekambaram, B.Sc. Ag., underwent training in Animal Husbandry and Dairying at Bangalore.	16th June 1935 .	Transferred from the Department.	
5. Dry Farming Scheme, Hagari (Madras Presidency).	Superintendent, Agricultural Research Station, Hagari.	Mr. C. Vijayaraghava Acharya, L.Ag.	14th April 1934 .	Transferred from the Department.	
	Soil Physicist . . .	Dr. A. Subba Rao, M.A., Ph.D.	10th March 1936	Transferred from the Department.	
	Assistant in Plant Physiology.	Mr. V. Panduranga Rao, M.A. (Botany and Zoology).	1st October 1935	Transferred from the Department.	On leave for 1 year to undergo training in Plant physiology under Prof. Weaver in the University of Nebraska, Lincoln (U. S. A.).
	Assistants for Millets .	Mr. P. Seshadri, B.Sc. Ag. .	7th May 1934 .	...	
		Mr. P. Krishnaswami, B.Sc., Ag.	31st October 1936	Transferred from the Department.	
	Assistants to Soil Physicist	Mr. S. V. Kuppuswamy Ayyangar.	10th March 1936	Transferred from the Department.	
		Mr. A. Abdul Samad, B.A. (Physics and Chemistry), B.Sc. Ag.	7th May 1934 .	Transferred from the Department.	
6. Fruit Research Station, Anantarajupet.	Superintendent . .	Mr. K. C. Naik, B.Ag. (Bombay), M.Sc. (Bristol).	3rd Aug. 1935 .	Through the Public Service Commission.	
	Farm Manager, Fruit Research Station.	Mr. M. Subba Reddy, B.Sc. Ag.	14th October 1936	Transferred from the Department.	
7. Marketing Scheme . .	Assistant Marketing Officers	Mr. S. N. Venkatarama Ayyar, B.A. (Physics and Chemistry), B.Sc. Ag., underwent Statistical training at Calcutta.	21st February 1935.	Transferred from the Department.	
		Mr. K. W. Chakrapani Marar, L. Ag.	25th February 1935.	Promoted from the Department.	
		Mr. M. P. Kunhikutti, L.Ag., underwent post-graduate course in Animal Husbandry and Dairying at Bangalore.	23rd February 1935.	Promoted from the Department.	
8. Cholam Malting Scheme .	Assistant Agricultural Chemist.	Mr. M. Suryanarayana, B.Sc. (Cal.).	5th June 1935 .	Transferred from the Department.	

9. Scheme of Research on Groundnuts. :	Superintendent, Agricultural Research Station, Tindivanam.	Mr. C. M. John, B.A. . .	22nd January 1937.	Promoted from the Department.	
	Assistants . . .	Mr. C. R. Seshadri, B.A., B.Sc. Ag.	1st February 1937	Transferred from the Department.	
		Mr. M. Bhavani Shankar Rao, B.Sc. Ag.	22nd January 1937.	Transferred from the Department.	
Animal Husbandry Schemes.					
10. Veterinary Diseases Investigation Scheme.	Veterinary Investigation Officer, Madras. :	Mr. G. R. Viswanathan, Graduate, Madras Veterinary College.	13th April 1933 .	Transferred from the Department.	Work completed on 28th February 1937 and the officer reverted to the Department from 1st March 1937.
11. Animal Nutrition Scheme	Assistants . . .	Mr. Y. V. Narayanayya, B.A. B.Sc. Ag.	19th June 1935 .	Transferred from the Department.	
		Mr. S. Varadarajan, B.Sc., Ag.	16th September, 1935.	Transferred from the Department.	
		Mr. K. M. Krishna Menon, B.Sc. Ag.	16th September 1935.	Transferred from the Department.	
		Mr. C. Balasubramaniyan, B.A., B.Sc. Ag.	16th September 1935	Transferred from the Department.	
BOMBAY.					
1. Investigation of diseases in livestock and their treatment.	Veterinary Investigation Officer, Bombay Presidency.	Mr. R. N. Naik, G.B.V.C. .	27th June 1932 .	Recruited through the Public Service Commission (India).	
2. Sugarcane Research Scheme for the Deccan, Padegaon.	Principal Agricultural Officer.	Rao Saheb B. P. Vagholkar, L.Ag. (Bom.).	6th June 1932 .	Deputed from the Bombay Agricultural Department.	
	Crop Physiologist . .	Dr. R. D. Rege, M.Sc. (Bom.), Ph. D. (London).	6th July 1932 .	Recruited through the Board of Selection appointed by the Government of Bombay.	
	Soil Physicist . . .	Dr. J. K. Basu, M.Sc. (Cal.), Ph D (Lond).	18th June 1932 .	Recruited through the Board of Selection appointed by the Government of Bombay	
	Agricultural Overseers .	Mr. V. N. Apte, B.Ag. (Bom.)	18th December 1931.	Deputed from the Bombay Agricultural Department.	
		Mr. N. B. Patwardhan, B.Ag. (Bom.).	1st March 1932 .	Deputed from the Bombay Agricultural Department.	
		Mr. P. S. Kulkarni, B.Ag. (Bom.).	15th October 1932.	Deputed from the Bombay Agricultural Department.	
		Mr. P. B. Wagle, M.Ag. (Bom.).	1st March 1932 .	Deputed from the Bombay Agricultural Department.	
		Mr. S. K. Sannabhadti, B.Ag. (Bom.).	1st September 1935.	Deputed from the Bombay Agricultural Department.	
		Mr. S. S. Sirur, B.Ag. (Bom.).	5th August 1932.	Transferred from the scheme financed from the funds of the Indian Central Cotton Committee.	
		Mr. V. D. Tagare, B.Ag. (Bom.), B.Sc. (Bom.).	13th August 1932	Recruited by the Director of Agriculture, Bombay Presidency.	
3. Dry Farming Research Scheme.	Chief Investigator, Dry Farming Research Scheme, Sholapur.	Mr. N. V. Kanitkar, M.Ag. B.Sc.	1st October 1933	Deputed from the Bombay Agricultural Department.	

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
BOMBAY—*contd.*					
Main-centre, Sholapur . .	Assistant Investigator, Dry Farming Research Scheme in charge of Soil Section.	Dr. V. N. Gokhale . .	23rd December 1936.	Deputed from the Bombay Agricultural Department.	
	Senior Assistant in Charge of Plant Section.	Mr. R. B. Gode, M.Sc. .	18th October 1933	Transferred from the scheme financed from the funds of the Indian Central Cotton Committee.	
	Superintendent, Dry Farming Research Scheme, Main-centre.	Mr. G. M. Bapat, M.Ag. .	1st October 1933	Deputed from the Bombay Agricultural Department.	
	Senior Assistant in Plant Section.	Mr. D. H. Gokhale, M.Ag.	12th October 1933	Recruited by the Director of Agriculture Bombay Presidency.	
	Junior Assistant in Soil Section.	Mr. Y. S. Rane, B. Ag. .	1st October 1933	Recruited by the Director of Agriculture, Bombay Presidency.	
Sub-centre Bijapur . .	Superintendent, Dry Farming Research Scheme, Sub-centre, Bijapur.	Mr. K. D. Gomaste, B. Ag. .	Do. .	Deputed from the Bombay Agricultural Department.	
	Junior Assistant at Bijapur.	Mr. G. B. Badami, B. Ag. .	2nd October 1933.	Recruited by the Director of Agriculture, Bombay Presidency.	
4. Scheme for an Economic Enquiry into the cost of production of crops in the principal sugarcane and cotton tracts of India.	Provincial Officer in charge Economic Enquiry, Bombay, Poona.	Mr. T. B. Pawar, B.Ag. (Bom.)	1st April 1933 .	Deputed from the Bombay Agricultural Department.	
	District Supervisors . .	Mr. S. T. Purandare. B.Ag. (Bom.).	3rd April 1933 .	Recruited by the Director of Agriculture, Bombay Presidency	
		Mr. S. F. Chandrannavar, B.Ag. (Bom.).	3rd April 1933 .	Recruited by the Director of Agriculture, Bombay Presidency	
		Mr. P. R. Patil, B.Ag. (Bom.).	3rd April 1933 .	Recruited by the Director of Agriculture, Bombay Presidency.	
		Mr. D. A. Patel, B.Ag. (Bom.)	3rd April 1933 .	Recruited by the Director of Agriculture, Bombay Presidency.	

5. The Cold Storage Research Scheme.	Senior Research Assistant .	Dr. D. V. Karmarkar, M.Sc. (Bom.), Ph.D. (Bristol), A.I.I.Sc.	1st March 1934 .	Recruited by the Director of Agriculture, Bombay Presidency.	
	Junior Research Assistant.	Mr. B. M. Joshi, M.Sc. . .	1st March 1934 .	Deputed from the Bombay Agricultural Department.	
	Senior Mechanic . .	Mr. C. L. Barve, B.E. (Mech.)	Do. .	Recruited by the Director of Agriculture, Bombay Presidency.	
6. Scheme for improvement of marketing in India.	Assistant Marketing Officers	Mr. M. M. Desai . . .	5th April 1935 .	Deputed from the Bombay Agricultural Department.	
		Mr. N. V. Bhagwat, B. Ag. .	Do. .	Ditto.	
		Mr. B. H. Patil, B. Ag. .	8th July 1935 .	Ditto.	
		Mr. B. P. Deshpande, M. Ag..	5th April 1935 .	Ditto.	
SIND.					
Economic enquiry into the cost of production of cotton in Sind.	District Supervisor, Hyderabad.	Mr. G. T. Nagrani, B. Ag. (Bombay).	10th March 1933 .	Appointed by the Chief Agricultural Officer in Sind.	
Scheme for Improvement of Marketing in India.	Marketing Officer, (Cereals Group).	Mr. K. A. Advani, M.Sc. (Texas).	20th May 1935 .	Recruited through Public Service Commission.	
	Marketing Officer (Livestock).	Mr. L. M. Hira, G. B. V. C. A., A. R. San. I (London).	1st September 1935	Ditto.	
	Marketing Officer (Special Crops).	Mr. Mahomed Bachal Memon, B. Ag. (Bombay).	11th June 1935	Ditto.	
BENGAL.					
1. Rice Research Scheme . .	Rice Research Officer .	Babu Suresh Chandra Chakravarty, B.Sc. I.Ag.	1st June 1932 .	Promoted from the Department.	
	Rice Research Officer .	Babu Kshitis Chandra Banerjee, B.A., L.Ag.	1st June 1932 .	Promoted from the Department.	
	Assistant. . . .	Babu Jnan Ranjan Pal, B.Ag.	1st June 1932 .	Recruited by the Department.	
	Assistant . . .	Mr. E. A. R. Banerjee, M.Sc.	9th December 1932.	Recruited by the Department.	
2. Animal Nutrition Scheme .	Physiological Chemist .	Babu Indu Bhusan Chatterjee, L.Ag.	2nd January 1932.	Promoted from the Department.	
	Assistant Chemists . .	Mr. Md. Abdul Hai, M.Sc. .	2nd January 1932.	Recruited by the Department.	
		Babu Sachindra Nath Sarkar, M.Sc.	16th July 1935 .	Ditto.	} Discharged from 2nd January 1937.
	Field Assistant . .	Babu Subodh Kumar Talapatra, B.Sc.	1st July 1935 .	Ditto.	} Discharged from 2nd January 1937.
3. Scheme for Physical and Chemical Research into soils.	Physical Assistant . .	Babu Manindra Nath Chakladar, M.Sc.	1st June 1932 .	Recruited through Public Service Commission (India).	
4. Scheme for establishing sugarcane seedling testing station in Bengal.	Field Assistant . .	Babu Surendra Nath Bhattacharjee.	22nd July 1935 .	Promoted from the Department.	
5. Horticultural Scheme in Bengal.	Horticultural Officer .	Mr. V. N. Vadhawkar, B.Ag.	9th April 1934 .	Recruited through the Public Service Commission (India).	
6. Scheme for economic enquiry into the cost of production of crops of the principal sugarcane and cotton tracts in India.	District Supervisor . .	Babu Benode Lal Mukherjee, B.Ag.	1st June 1936 .	Promoted from the Department.	
	Investigator . . .	Babu Santi Priya Bose, B.Sc. (Edin.)	11th September 1933.	Promoted from the Department.	

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
BENGAL—*contd.*					
7. Scheme for Appointment of marketing staff in Bengal.	Senior Marketing Officer .	Mr. A. K. Malik, M.A., B.Sc. (Edin.)	7th February 1935	Promoted from the Department.	
	Assistant Marketing Officers:	Babu Hiron Kumar Basak, L.Ag.	25th July 1935 .	Promoted from the Department.	
		Babu Kshitish Chandra Guha, B.Sc. (Edin.)	5th August 1935 .	Promoted from the Department.	
		Babu Bhabesh Ch. Roy, L.Ag.	April 1936 .	Ditto.	
		Moulvi Abdul Wahab Mollah, L.Ag.	20th July 1935 .	Promoted from the Department.	
8. Schemes for the Appointment of a Veterinary Investigation Officer in Bengal.	Veterinary Investigation Officer.	Mr. B. Singh, G. B. V. C. .	15th July 1936 .	Recruited by the Government of India, Department of Education, Health and Lands from the staff of the Imperial Veterinary Research Institute, Muktesar.	
9. Scheme for systematic cultivation of medicinal plants and study of food poisons	Botanist	Mr. R. L. Bahadwa, M.Sc. .	13th April 1935 .	Recruited by the Department.	
	Experimental Assistant .	Dr. N. N. Das, M.Sc., M.B. .	13th April 1935 .	Recruited by the Department.	
	Chemist . . .	Mr. J. K Lahiri, M.Sc. (Lon.), A.I.C.	13th April 1935 .	Recruited by the Department.	
10. Linseed Scheme . . .	Analytical Chemist . .	Babu Tarapada Banerjee, M.Sc.	1st October 1936.	Recruited by the Department.	
UNITED PROVINCES.					
1. Rice Research Scheme at Nagina.	Assistant Paddy Specialist.	Dr. B. L. Sethi, M.Sc., Ph.D. (Aberystwyth).	13th April 1932 .	Recruited through a Selection Board.	Offg. as E. B. (Sugar cane) with effect from 16th June 1936 for 10 months *vice* Mr. R. L. Sethi, I. A. S., deputed to Government of India.
	Farm Superintendent .	B. Sanjai Singh (2 year course Agri. College).	1st March 1935 .	Promoted from the Department.	
	Research Assistants . .	Mr. T. R. Mehta, B.Sc. (Pusa trained).	1st March 1932 .	Direct appointment . .	Offg. as Asstt. Paddy Specialist with effect from 16th June 1936 for 10 months, *vice* Dr. B. L. Sethi.
		Mr. P. S. Gupta, M.Sc. .	13th August 1935	Direct Appointment.	
		Mr. R K Tandon, B.Sc,. M.Sc	3rd August 1936 .	Ditto. . .	Appointed temporarily in place of Mr. T. R. Mehta.

2. Research into the development of the fruit Industry in the hills in U. P.	Soil Chemist . . .	Dr. R. S. Gupta, M.Sc., Ph.D., A.I.C.	10th July 1934 .	Recruited through the Public Service Commission (India).	
	Horticulturist . . .	Mr. R. S. Singh, B.Sc. (Reading), L.Ag.	10th July 1934 .	Recruited through the Public Service Commission (India).	
	Mycologist . . .	Mr. Udai Bhan Singh, M.Sc. .	10th July 1934 .	Recruited through the Public Service Commission (India).	
	Entomologist . . .	Mr. Ram Narain Singh, L.Ag.	10th July 1934 .	Recruited through the Public Service Commission (India).	
	Assistant Entomologist .	Mr. G. D. Bhat, B.Ag. .	10th July 1934 .	Direct appointment.	
3. Investigation into the problem of the sugar industry in the U. P.	Cane Physiologist . .	Dr. R. N. Mathur, M.Sc., Ph.D. (Agri.)	15th January 1934.	Direct appointment.	
	Chemical Assistant . .	Mr. Iqbaluddin Hyder, B.Sc. (Bristol), Ag.	27th July 1935 .	Direct appointment.	
	Research Assistant . .	Mr. D. C. Agarwal, L. Ag. (post-graduate, Pusa).	15th January 1934.	Promoted from the Department.	
	Entomologist . . .	Mr. B. D. Gupta, M.Sc. .	15th January 1934.	Direct appointment.	
	Cane Agronomist . .	Mr. Imdad Ali Khan, B.Sc. (Agri.) (Punjab).	14th December 1934.	Recruited through the Public Service Commission (India).	
4. U. P. Marketing Scheme .	Assistant Marketing Officers	Mr. P. L. Gaur, B. Sc. .	12th June 1935 .	Recruited through the Public Service Commission.	
		Mr. Shri Ram Singh . .	1st June 1935 .	Recruited through the Public Service Commission.	
		Mr. Pati Ram Kala . .	5th June 1935. .	Recruited through the Public Service Commission.	
5. Dr. A. E. Slater's scheme of improvement of goats.	Assistant. . . .	S. Sardar Singh Bhatia, I. D. D.	15th October 1931	Appointed by Dr. Slater.	
6. Appointment of Veterinary Investigation Officer in the United Provinces.	Veterinary Investigation Officer.	Mr. Harsh Bahadur Shahi, M.Sc., M. R. C. V. S., D.T.V.M.	4th April 1933 .	Direct appointment. . .	Was a State veterinary scholar of the United Provinces Government in the United Kingdom prior to his appointment as Veterinary Investigation Officer.
7. Grant to Harcourt Butler Technological Institute, United Provinces, to maintain and run the Oil Section.	Head of the Oil Chemistry Section.	Mr. D. Y. Athawale, M.Sc. (offg.)	24th September 1934.	Appointed by the Department.	The grant to the Oil Section of the Institute is Rs. 30,000 for 1936-37 to maintain and run the Oil Section. The deficit of pay of the staff and other contingent charges are met from the budget of the United Provinces Government.
	Lecturer in Oil Technology	Dr. N. G. Chatterji, D.Sc., D. I. C., A.I.C., A.M.I. Chem. E., LL.B. (offg.)	10th October 1919 and to the department 15th March 1921.	Appointed by the Department.	
	Assistant Research Chemist.	Mr. H. M. Mulany, M.Sc. .	3rd February 1922	Appointed by the Department.	

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
PUNJAB.					
1. Sugarcane Research Scheme	Sugarcane Specialist .	S. Harbans Singh, B.Sc. (Agr.) (Punjab).	11th November 1934.	Promoted from the Department on the recommendations of the Public Service Commission.	
	Agricultural Assistants, A. Class.	Bh. Balwant Singh Butter, B.Sc. (Agri.)	24th January 1934.		
		Bh. Atam Singh Kochhar, B.Sc. (Agri.)	1st Febraury 1934		
		Bh. Dalbir Singh, B.Sc. (Agri.)	1st February 1934		
		Bh. Sardul Singh, B.Sc. (Agri.)	1st February 1934		
		M. Abdul Latif, B.Sc. (Agri.)	1st August 1934 .	Appointed by Director of Agriculture, Punjab, who is competent to make the appointment.	
2. Locust Research Scheme .	Agricultural Assistants, A. Class.	Mr. C. B. Mathur, M.Sc. (Zoology), Lucknow University.	2nd January 1931		
		M. Abdul Haq, B.Sc. (Agri.)	9th August 1933.		
3. Fruit and Vegetable Preservation Scheme.	Research Assistant . .	Dr. Girdhari Lal . . .	8th November 1934		
4. Scheme for Improvement of Marketing in India.	Assistant Marketing Officer (Fruit).	S. Pritam Singh Diol, M.Sc. (Agri.) Mich. (U. S. A.),	15th March 1935	Promoted from the Department by the Punjab Government.	
	Assistant Marketing Officer (Livestock).	L. Harjas Rai, L.V.P. (Punjab),	15th March 1935.		
	Assistant Marketing Officer (Oilseeds).	Ch. Zafar Alam, B.Sc. Agri. (Punjab), M.Sc. (London), F.L.S.	11th August 1935		
5. Appointment of a Veterinary Investigation Officer in the Punjab.	Veterinary Investigation Officer.	Mr. S. M. Sarwar, M.R.C. V.S.	1st October 1932	Selected by Director, Veterinary Services, Punjab, from amongst officers serving in the Civil Veterinary Department and selection approved by the Imperial Council of Agricultural Research on the recommendations of the Punjab Government.	
6. Parasitological Research to be undertaken at the Punjab Veterinary College, Lahore.	Veterinary Assistant .	L. Karam Chand, L. V. P. .	16th July 1934 .	Selected by the Director, Veterinary Services, Punjab, on the recommendations of the Principal, Punjab Veterinary College, Lahore, out of the L. V. Ps. of the 1934 session.	
7. Dry Farming Research Scheme.	Agriculturist . .	L. Tehl Ram . . .	1st July 1935 .	Promoted from the Department by the Punjab Government.	
	Soil Physicist . . .	L. Sukh Dayal, M.Sc. (Pb.). .	1st July 1935 .	Promoted from the Department on the recommendations of the Public Service Commission (India).	

	Plant Physiologist . .	Mr. I. M. Rao, M.A., M.Sc. (Madras).	14th March 1936 .	Recruited through the Public Service Commission (India).	
	Agricultural Assistants, A. Class.	M. Mohammad Afzal . .	1st July 1935 .	Appointed by Director of Agriculture, Punjab, who is competent to make the appointment.	
		L. Girdhari Lal . . .	1st July 1935 .	Appointed by Director of Agriculture, Punjab, who is competent to make the appointment.	
8. Investigation of indigenous sheep breeding at the Government Cattle Farm, Hisar.	Veterinary Assistant Surgeon.	Bh. Gurbakhsh Singh, L.V.P.	...	...	
9. Scheme for investigating electric method hygrometry.	...	Mr. Mohd. Ibrahim, M.Sc. .	...	...	
10. Citrus Stock Scheme .	Agricultural Assistants, A. Class.	Mr. B. S. Mahangar, M.Sc. .	18th August 1936	Appointed by Director of Agriculture, Punjab.	
11. Oilseed Research . .	Agricultural Assistants, A. class.	Bh. Dayal Singh Johar, M.Sc.	1st October 1936 .	Ditto.	
		Ch. Bashir Ahmed, B.Sc. Agri.	3rd July 1936 .	Ditto.	
		M. Mohd. Mumtaz, B.Sc. Agri.	17th September 1936.	Ditto.	
		M. Sultan Ahmed, B.Sc. Agri.	1st November 1936.	Ditto.	
BURMA.					
1. Rice Research Scheme . .	Rice Research Officer .	Mr. J. W. Grant, M.A., B.Sc., I.A.S.	10th December 1932.	Promoted from the Burma Agricultural Department.	
	Assistant Rice Research Officer.	Mr. R. M. Row, B.A., M.Sc. (London).	6th February 1935	Through the Public Service Commission.	
	Senior Agricultural Assistant	U Thein Aung, Diploma in Agriculture.:	6th July 1932 .	Promoted from the Burma Agricultural Department.	
2. Marketing Scheme . .	Marketing Officer . .	Mr. F. D. Odell, M.A., I.A.S.	1st Februaruy 1935	Promoted from the Burma Agricultural Department.	
	Assistant Marketing Officer.	U Khin, B.Sc. (Horticulture).	1st February 1935	Direct appointment.	
	Assistant Marketing Officer.	U Hpu, Diploma in Agriculture.	8th February 1935	Promoted from the Burma Agricultural Department.	
	Assistant Marketing Officer.	U Kyin Sein, Diploma in Agriculture.	8th February 1935	Promoted from the Burma Agricultural Department.	
BIHAR.					
1. Rice Research Scheme. (Sanctioned for 5 years* from the 20th January 1932).	Rice Specialist . .	Mr. M. Mahbub Alam, M.Sc. (Lucknow).	20th January 1932.	Deputed from the Bihar Agricultural Department.	Economic Botanist deputed to work as Rice Specialist from the 20th January 1932.
	Assistant Botanist . .	Mr. A. Rashid Akhtar, M.Sc. (Punjab).	2nd April 1932 .	Appointed by Local Government.	

*The scheme has been extended for 3 years from 20th January 1937. The Orissa Scheme which was joint up to 19th January 1937 has been separated from Bihar from 20th January 1937.

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
BIHAR—*contd.*					
	Assistant Botanist * ..	Mr. Awadh Bihari Saran, M.Sc. (Agra).	16th September 1932.	Appointed by Local Government.	* Abolished with effect from 20th January 1937.
	Senior Research Assistant*	Mr. P. D. Dixit, M.Sc. (Lucknow).	1st February 1932	Appointed by the Director of Agriculture, Bihar.	
	Senior Research Assistant .	Mr. R. A. P. Trivedi, M.Sc. (Benares Hindu University).	5th December 1932.	Appointed by the Director of Agriculture, Bihar.	
	Junior Research Assistant	Mr. M. Anwarul Aziz Khan, B.Sc. (Agra).	20th February 1934.	Appointed by the Director of Agriculture, Bihar.	
	Junior Research Assistant	Mr. N. P. Chaudhury, M.Sc. (Lucknow).	3rd January 1933	Appointed by the Director of Agriculture, Bihar.	
2. Sugarcane Research Scheme (Sanctioned for 5 years† from 18th March 1932).	Sugarcane Specialist .	Mr. K. L. Khanna, B.Sc., (Agri.) (Punjab).	18th March 1932 .	Through the Public Service Commission (India).	† Scheme extended for 3 years from 18th March 1937.
	Physiological Assistant .	Mr. P. C. Raheja, M.Sc. (Agri.) (Punjab).	17th December 1933.	Through the Public Service Commission (India).	
	Chemical Assistant . .	Mr. Sailesh Chandra Sen, M.Sc.	23rd December 1933.	Through the Public Service Commission (India).	
	Botanical Assistant . .	Mr. Rama Rao Panje, M.A. (Madras).	2nd January 1934	Through the Public Service Commission (India).	
	Field Assistant . .	Mr. Prabhat Kumar Rai, M.Sc.	17th December 1935.	Appointed by the Director of Agriculture, Bihar.	
3. Fruit Research Scheme. (Sanctioned for 5 years from the 3rd April 1934).	Horticulturist . . .	Mr. Zarbakht Khan, B.Sc., (Agri.) (Edin).	21st April 1935 .	Through the Public Service Commission (India).	
	Botanical Assistant . .	Miss Rajul Shah, B.Ag. (Bomb.), M.Sc. (Mich., U. S. A.).	22nd February 1935.	Appointed by the Director of Agriculture with the consultation of the Provincial Selection Board.	
	Physiological Botanist .	Dr. Pabitra K. Sen . .	...	Through the Public Service Commission (India)	Undergoing training in England.
	Biochemical Assistant .	Mr. Sheo Nath Prasad, M.Sc..	13th March 1935 .	Appointed by the Director of Agriculture with the consultation of the Provincial Selection Board.	
4. Sugarcane Enquiry Scheme. (Sanctioned for 3½ years from the 15th August 1933).	Supervisor . . .	Babu Bansidhar Ghosh .	20th May 1935 .	Appointed by the Director of Agriculture, Bihar.	
	Supervisor . . .	Mr. Kishundeo Prasad .	1st April 1935 .	Appointed by the Director of Agriculture, Bihar.	

5. Scheme of investigation on the possibilities of manufacturing "Khandsari" sugar by the single pan method. (Sanctioned for 3 years from the 2nd January 1935).	Graduate Assistant . .	Mr. Thakur Prasad, M.Sc. .	2nd January 1935	Appointed by the Director of Agriculture, Bihar.	
Scheme for Village Enquiry regarding Cattle and Production and consumption of Milk. (Sanctioned for 6½ months from 12th August 1936).	Supervisor . . .	Babu Rajendra Prasad, B.Sc. (Pat.).	12th August 1936.	Appointed by the Director of Agriculture, Bihar.	
Marketing Scheme, Bihar .	Senior Marketing Officer . .	(*a*) (*b*) Mr. B. N. Sarkar, L.Ag. (Sabour).	13th March 1935 .	Appointed by the local Government.	(*a*) Deputy Director of Agriculture, deputed to work as Senior Marketing Officer. (*b*) Paid by the Government of Bihar and Orissa.
	Junior Marketing Officers .	Mr. Promode Ranjan Hansdah Acharjee, M.A., B.Sc. (Michigan).	1st June 1935 .	Through the Public Service Commission (India).	
		Mr. Manilal Harinarayan Jani, B.Sc. (Edin.) N. D. D.	28th May 1935 .	Through the Public Service Commission (India).	
		Mr. Premchandra Verma, B.Sc., Ag.	24th May 1935 .	Through the Public Service Commission (India).	
		(*c*) Babu Madan Mohan Pradhan.	29th March 1936 .	Appointed by the Director of Agriculture, Bihar.	(*c*) Sanctioned for five months.
Scheme for the analysis of indigenous fodders in Bihar. (Sanctioned for 5 years started from 1st October 1936).	Chemical Assistants . .	Babu Shiva Kumar Narayan, M.Sc. (Lucknow).	1st October 1936 .	Appointed by the Director of Agriculture, Bihar.	
		Maulvi Zafar Ahmad, M.Sc. (Pat.), A. H. B. T. I. (Cawnpore).	1st October 1936	Appointed by the Director of Agriculture, Bihar.	
9. (Veterinary) Scheme for investigation of diseases.	Veterinary disease investigation Officer.	Mr. Lakshmi Sahai, M. Sc. (Allahabad), M. R. C. V. S.	2nd May 1932 .	Appointed by the local Government on the recommendations of the Provincial Selection Board.	
CENTRAL PROVINCES.					
1. Scheme for the improvement of rice cultivation in the Central Provinces.	Botanist	Mr. B. B. Dave, L.Ag. . .	1st September 1932.	Selected from the Department by the Public Service Commission.	
	Assistants . . .	R. G. Joglekar, B.Ag. . .	18th November 1932.	Recruited locally.	
		S. L. Vishnoi, B.Ag. .	23rd June 1933 .	Recruited locally.	
		Mr. H. P. Misra, B.Ag. .	18th November 1934.	Recruited locally.	
		Mr. S. N. Walkade, B.Ag. .	29th July 1935	Recruited locally.	

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
CENTRAL PROVINCES—*contd.*					
2 Scheme for an Economic Enquiry into the cost of production of cotton crop.	Provincial Officer . .	Mr. P. D. Nair, M.A., L.Ag., (Hon.) (Post Graduate, Pusa).	1st May 1933 .	Promoted from the Department.	
	District Supervisors . .	Mr. B. G. Khandekar, B.Ag. .	29th May 1933 .	Promoted from the Department.	
		Mr. K. R. Dube, B.Ag. .	29th May 1933 .	Recruited locally.	
		Mr. D. R. Dhodapkar, M.Sc., A.A.G.	8th January 1934 .	Recruited locally.	
3. Scheme for the improvement of Marketing in India.	Assistant Marketing Officers	Mr. G. D. Mehta, B.Ag. .	11th February 1935	Seconded from the Department of Agriculture.	
		Mr. A. X. Rebello, B.Ag. .	5th February 1935.	Seconded from the Department of Agriculture.	
		Mr. N. S. Pathak, G.B.V.C. .	2nd February 1935	Seconded from the Veterinary Department.	
4. Investigation of animal diseases in the Province.	Veterinary Investigation Officer.	Mr. Bachan Singh, M.R.C.V.S.	20th June 1932 .	Through the Public Service Commission (India).	
5. Scheme for the investigation of the Gangai Pest of Rice.	Entomological Assistant .	Mr. P. J. Deoras, M.Sc., LL.B.	21st July 1936 .	Recruited locally.	
6. Sunn-hemp Scheme . .	Research Assistant .	Mr. R. D. Mukerji, B.Ag. .	11th January 1937.	Recruited locally.	
7. Oil seed Research Scheme .	Oil seed Specialist . .	Dr. R. H. Richharia, M.Sc., Ph.D. (Cantab.).	10th February 1937.	Through the Public Service Commission (India).	
8. Village Enquiry regarding Cattle and production and consumption of Milk.	Supervisor . . .	Mr. R. N. Dubey, L.Ag. (Post Graduate in Dairying).	16th August 1936	Promoted from the Department.	
Vaccination of cattle against Rinderpest.	Senior Veterinary Assistant Surgeon.	Mr. G. D. Pani, G.M.V.O. .	15th March 1935 .	Appointed from the Department.	
	Veterinary Assistant Surgeons.	Mr. P. S. Nair, G.V.Sc. .	15th March 1935 .	Fresh Appointment.	
		Mr. C. G. Kurian, G.V.Sc. .	15th March 1935 .	Fresh appointment.	
		Mr. S. B. Balkrishna, G. M. V. C.	15th March 1935 .	Fresh appointment.	
		Mr. V. Srinivasan, B.A., G.M. V.C.	15th March 1935 .	Fresh appointment.	
		Mr. Raghunath Prasad, G.B. & O.V.C.	15th March 1935 .	Fresh appointment.	
		Mr. Ram Deni Prasad, G.B. & O.V.C.	15th March 1935	Fresh appointment.	
		Mr. B. N. Swamy, G.B.V.C.	21st March 1935 .	Fresh appointment.	
		Mr. Parameshwar Iyer, G.B. V.C.	10th November 1936.	Fresh appointment.	
		Mr. M. P. Jhanek, G. M.V.C.	16th November 1936.	Fresh appointment.	
		Mr. Unidhan, G.M.V.C. .	14th December 1936.	Fresh appointment.	

Assam.				
1. Investigation of animal diseases in Assam.	Veterinary Investigation Officer, Assam.	Pandit Gajanan Pande, M.Sc., M.R.C.V.S.	16th April 1933 .	Through the Public Service Commission (India).
2. Sugarcane Research Scheme, Jorhat.	Chemical Assistant . .	Mr. Hemendra Nath Pal, M.Sc. (Chemistry).	3rd October 1933.	Appointed by the Director of Agriculture.
	Assistant Manager . .	Mr. Bhubaneswar Das . .	1st November 1935.	Transferred from the Department.
3. Agricultural Marketing Survey.	Senior Marketing Officer .	Mr. L. K. Hardique, B.Sc. (Edin).	13th February 1935	Promoted from the Department.
	Assistant Marketing Officers	Mr. Narmada Kumar Das, L.Ag. (Hon.)	1st March 1935 .	Promoted from the Department.
		Mr. Mashahid Ali, B.Ag. .	4th April 1935 .	Promoted from the Department.
4. Deep Water Paddy Farm, Habiganj, Sylhet.	Economic Botanist . .	Mr. S. Majid, B.Sc. . .	13th September 1934.	Recruited locally.
	Botanical Assistant . .	Babu Sashindra Chandra Bhattacharji, B.Ag.	24th October 1934	Transferred from the Department.
	Manager	Mr. Hiron Kumar Das, B.Ag.	16th December 1935.	Direct appointment.
	Assistant Manager . .	Mr. Bejomkesh Ranjan Dutta, B.Ag.	25th May 1935 .	Direct appointment.
North-West Frontier Province.				
1. Improvement of marketing in the North-West Frontier Province.	Assistant Marketing Officers	Ch. Ghulam Qadir, P.V.S. .	10th May 1935 .	Direct appointment.
		Mr. Supra, B.A., Economics .	1st May 1935 .	Direct appointment.
2. (Veterinary) Scheme for investigation of disease.	Disease Investigation Officer	Mr. S. R. Chadda, B.Sc., M.R.C.V.S.	7th July 1935 .	Direct appointment.
Hyderabad State.				
1. Dry Farming Research Scheme.	Superintendent . .	Mr. Shameem Zuhrie, B.Sc., C.D.A. (Glas.).	29th August 1936	Promoted from the Department.
	Senior Assistant . .	Mr. P. K. Savanur, B.Ag. .	4th July 1934 .	Promoted from the Department.
2. Castor Research Scheme .	Technical Assistants .	Dr. L. G. Kulkarni, Ph.D. .	6th September 1935.	Direct appointment.
		Mr. N. G. Masur, B.Ag. .	10th October 1935	Services obtained from Bombay Government.
Mysore State.				
1. Scheme for the Investigation of Fish Poisons and other Indian Forest Products.	Assistant Entomologist .	Mr. M. Puttarudriah, B.Sc. (Hons.).	20th December 1934.	
	Assistant Chemist . .	Mr. K. Lakshminarayana Bhatta, B.Sc.	20th December 1934.	
2. Sugarcane Research Scheme (Breeding of Thick Canes).	Senior Assistant Botanist .	Dr. L. S. Dorasami, B.Sc. (Hons.), M.Sc. (Lond.), Ph. D. (Lond.).	1st February 1933	
	Junior Assistant Botanist .	Mr. M. L. Subbanna, B.Sc. (Hons.).	1st February 1933	
3. Investigation of Johne's Disease Research Scheme.	Veterinary Inspector .	Mr. K. Srinivasamurthi, B.Sc., L.V.P.	21st January 1935	

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
BARODA STATE.					
1. Economic enquiry into the cost of production of crops in the principal sugarcane and cotton tracts.	District Supervisor . .	Mr. Anantrai Atmaram Mehta, B.Ag.	17th June 1935 .	Appointed from the Department.	
2. Investigation of suitable types of canes in Gujarat.	Sugarcane Chemist . .	Mr. Kusumayudh Chunilal Desai, B.Ag.	16th November 1936.	Recruited through the State Service Committee.	
CALCUTTA UNIVERSITY.					
1. Properties of Colloid Soil Constituents.	Senior Research Assistant	Mr. Ramprasad Mittra, M.Sc.	1st November 1935.	Direct appointment.	
	Junior Research Assistant .	Mr. Sudhamoy Mukerjee, M.Sc. (Calcutta).	7th December 1935.	Direct appointment.	
2. Investigation of the Life-history, Bionomics and Development of Fresh Water fishes of Bengal.	Research Assistants . .	Mr. Amal Krishna Mukherjee, M.Sc.	1st December 1936		
		Mr. Matiranjan Das, Gupta, M.Sc.	1st December 1936		
3. Statistical Studies and Training of Agricultural Officers in Statistics.	Teaching Assistant . .	Mr. S. S. Bose, M.Sc., P.R.S.	July 1931 . .	Through the Public Service Commission.	
	Research Assistant . .	Mr. R. C. Bose, M.A. . .	June 1935 . .		
DACCA UNIVERSITY.					
1. Dacca University scheme of research on the mechanical analysis of lateritic soils and on the nutrition of the rice plant.	Senior Assistant (Bio-Chemist). . .	Mr. P. K. De, M.Sc., A.I., I.Sc.	11th August 1930	Appointed through a Selection Board.	
	Assistant in Soil Chemistry	Mr. J. N. Chakravarty, M.Sc., Post Graduate Diploma, Pusa.	11th August 1930	Appointed through a tionSelec Board.	
	Junior Assistant . .	Mr. P. B. Bhattacharyya, M.Sc.	1st December 1933	Appointed through a Selection Board.	
	Typist Assistant . .	Mr. Muhammad Hatem Ali, B.Sc.	11th November 1935.	Appointed through a Selection Board.	
2. Scheme for investigation on organic constituents of Indian Soils.	Research Assistant in Agricultural Chemistry.	Dr. A. C. Bose, Ph.D., A.I.C.	12th November 1934.	Appointed through a Selection Board.	

AGRA UNIVERSITY.				
1. Investigation on "Cereal Rusts".	Senior Research Assistants	Mr. Raghubir Prasad Gupta, M.Sc. (Agra). Botany with special paper on parasitic Basidiomycetes. (including rusts).	1st April 1935 .	Direct appointment.
		Mr. Shyama Lala Sharma, M.Sc., (Agra). Botany with special paper on parasitic Basidiomycetes (including rusts).	1st April 1935 .	Direct appointment.
		Mr. H. L. Gulatia, B.Sc., (Punjab); B.Sc., (Hons.) Sch. M.Sc., (Hons. Sch.) (Punjab)—Botany.	1st April 1935 .	Direct appointment.
		Dr. G. T. Kale, B.Sc., (Bombay); D.Sc. (State-France) Dip. Mer.	22nd July 1936 .	Direct appointment.
		Mr. J. L. Merh, M.Sc. (Allahabad).	10th May 1935 .	Direct appointment.
		Mr. R. S. Mathur, M.Sc. (Lucknow).	26th September 1935.	Direct appointment.
	Junior Research Assistants	Mr. Ram Piyara Mal, B.Sc. (Ag.) (Punjab).	1st April 1935 .	Direct appointment.
		Mr. V. P. Gokhale, B.Ag. (Bombay).	23rd May 1935 .	Direct appointment.
	Meteorological Assistant .	Mr. Gulab Chand Goyal, M.Sc. (Agra).	15th July 1935	Direct appointment.
	Personal Research Assistant to Officer-in-Charge.	...	...	Vacant.
	Lecturer in Botany . .	Dr. R. P. Asthana, M.Sc. (Allahabad); Ph.D. (London); D.I.C. (London).	10th July 1936	Direct appointment.
	Junior Research Assistant	Mr. T. N. Shivapuri, M.Sc. (Agra).	3rd August 1936 .	Direct appointment.
	Wheat Breeding Assistant.	Mr. Abdul Aziz, B.Sc. (Ag.) (Punjab); Pusa trained.	7th April 1935 .	Direct appointment.
	Assistant for Survey (Punjab).	Mr. Sikandar Lal Sehgal, B.Sc. (Agri.) (Punjab).	17th October 1936	Direct appointment.
	Assistant for Survey (Bombay).	Mr. B. S. Varadarajan, B.Ag. (Bombay).	16th August 1935	Direct appointment.
	Assistant for Survey (Madras).	Mr. T. V. Pattabhiraman, B.Sc. (Ag.) (Madras).	10th October 1935	Direct appointment.

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1937

Annual Report of the Imperial Council of Agricultural Research for 1937-38.

The eigth annual report of the Imperial Council of Agricultural Research covers the period 1st April 1937 to 31st March 1938.

1. *Personnel of the Council.*—Sir Bryce C. Burt continued to officiate as Vice-Chairman except from the 30th May 1937 to 29th October 1937 when he was on deputation in England in connection with the Indo-British trade negotiations. During that period Mr. N. C. Mehta, I.C.S., dated as Vice-Chairman and Khan Sahib Bazlul Karim acted as Secretary to the Council. The activities of the Council have increased considerably during the past eight years and it was found necessary to provide some assistance to the two Experts to the Council. Two posts of Assistant Experts have therefore been created and Rai Bahadur R. L. Sethi, an officer of the Indian Agricultural Service, serving in the United Provinces and Mr. H. B. Shahi, M.Sc., of the United Provinces Veterinary Service, joined these appointments as Assistant Agricultural Expert and Assistant Animal Husbandry Expert respectively on the 9th August and the 8th September 1937. A post of an Under Secretary has also been created for a short period, to which Mr. S. Dutt, I.C.S., was appointed from the 8th March 1938. The composition of the Governing Body, the Advisory Board and Secretariat of the Council at the end of the year is shown in Appendix I.

2. *Burma.*—Consequent upon the separation from India, Burma ceased to be a member of the Council, but arrangements have been made to maintain the liaison between the two countries in agricultural matters of common interest. A reciprocal arrangement has been made that representatives of the Burma Agriculture and Veterinary Departments should be invited to attend meetings of the Advisory Board and Committees of the Council and of the Board of Agriculture and Animal Husbandry whenever there are topics which are likely to interest Burma and that Indian Agricultural and Veterinary representatives will be invited to attend similar meetings in Burma. Arrangements regarding the exchange of publications between this country and Burma remain unchanged.

3. *Indian States.*—The Hyderabad, Mysore, Baroda, Travancore, Cochin Bhopal and Kashmir States continued to be Constituent States of the Council.

4. *Meetings of the Council.*—The Advisory Board met twice and the Governing Body met once during the year. The Annual General Meeting of the Council took place on the 12th March 1938 when the annual reports on the working of the Council and on the accounts for 1936-37 were adopted. A Special General Meeting of the Council was convened on the 12th March 1938 at which various formal amendments to the Rules and Regulations of the Council, which were rendered necessary by the constitutional and other changes and developments, were passed.

A

5. *Finance.*—The following grants were received during the year from the Government of India:—

	Rs.
(i) Annual recurring grant	5,00,000
(ii) Grant for Sugar research	1,75,000
(iii) Grant for expenditure on provincial portion of the Marketing Schemes.	2,00,000
(iv) Special Grant for Sugar research work (from the Sugar Excise Fund).	2,50,000
(v) Grant for Cold Storage research	1,00,000

6. *Scientific Stock-taking.*—The reports of Sir John Russell and Dr. N. C. Wright to which a reference was made in the last year's report were received and published during the year. A detailed examination of the recommendations contained in these reports is in progress.

7. *Animal Health and Animal Husbandry.*—(i) *His Excellency the Viceroy's Cattle Improvement Drive.*—Mention was made in the previous report of the impetus given to the normal activities of the Council in matters relating to the improvement of Indian livestock by His Excellency the Viceroy's keen personal interest in this subject. The year under review stands out as an important landmark in the history of cattle improvement in India, for His Excellency initiated a movement of far reaching importance for the improvement of Indian cattle. The urgent need for increasing the supply of pedigree male stock for raising the quality of existing cattle has been emphasized; the importance of taking steps to obviate the premature slaughter of prime milch cows when they go dry in cities has been stressed, and a start has been made in collection of the data necessary to provide an economic background for a sound cattle breeding policy.

(ii) *Pedigree Bulls and Donations.*—The gift bulls presented by, and maintained at the expense of, His Excellency are playing an important role in the improvement of the cattle of the Delhi Province. Simultaneously with the presentation of these bulls His Excellency issued an appeal to persons of wealth and standing to donate pedigree bulls, or money for their purchase and maintenance, which has evoked a wide-spread response. In addition to a number of collective donations, as many as 1,073 persons came forward with donations of either animals or money. No fewer than 1,322 bulls were presented or promised, while cash subscriptions amounted to Rs. 1,65,000 excluding a special donation offered for the salvage of dry cows.

(iii) *Salvage of dry cows.*—His Excellency the Viceroy gave a practical lead here also by purchasing six dry cows from Calcutta and one dry buffalo from Bombay and presenting them to the Delhi *Pinjrapole.* This was accompanied by an appeal to the public to follow suit and thereby save valuable breeding material. The practical character of this step has been fully demonstrated by the fact that five of the cows have since given birth to healthy calves.

(iv) *Village Economic Enquiry on the production and consumption of milk.*—A brief description of the action taken under this scheme was included in the report relating to the preceding year. The enquiry was

undertaken at the instance of H. E. the Viceroy, who suggested the desirability of ascertaining, by direct enquiry, the actual position regarding the production and consumption of milk by cultivators in typical breeding tracts of India, with the object of obtaining an economic background to the general breeding policy to be advocated in such areas.

The enquiry lasted for five months and was conducted during the winter of 1936-37. The information collected as a result of this survey in seven of the most typical breeding tracts of India has been sifted and compiled so as to yield definite information as regards the conditions obtaining in these areas and the village practice in the rearing of cattle. The enquiry has revealed that the *per capita* consumption of milk and milk products in these areas, expressed in milk equivalent, averaged 10·16 ounces per day. Taking individual areas the daily consumption per head of milk and milk products expressed in milk equivalent is:—Montgomery 15·53, Hariana 12·39, Kankrej 12·07, Kosi 9·71, Ongole 8·73, Central Provinces 6·73 and Bihar 5·51 ozs. The balance of the *per capita* production, *viz.*, 13 ounces, is mostly sold off the holdings as milk or as ghee. A small proportion is stored as ghee for future use. In addition to the above in ghee producing areas, the skim milk derived from the ghee sold is also consumed locally. In the areas dealt with the average consumption of skim milk was 8.75 ozs. per head per diem. The report of the results of the investigations was favourably commented upon by the Standing Cattle Breeding Committee, the Advisory Board and the Governing Body of the Council and is being published as a bulletin for sale to the public.

(v) *Cattle Conference.*—With a view to discuss the main problems connected with livestock improvement in this country and to consider what practical steps could be taken to secure the better breeding and feeding of Indian cattle, an All-India Cattle Conference was convened by the Government of India and held in Simla on the 25th May 1937. The Conference was attended by provincial Ministers, representatives of the Government of India and of certain important Indian States, technical experts and a number of non-officials. The Conference was opened by H. E. the Viceroy and had before them the following subjects for discussion, *viz.*:—

(i) The setting up of suitable provincial cattle improvement funds on the lines suggested by the Animal Husbandry Wing of the Board of Agriculture as the best means of continuing the campaign for providing breeding bulls;

(ii) The improvement of grasslands and the better utilization of waste and surplus land for fodder production and the initial steps to be taken in that direction by the various appropriate agencies;

(iii) The need for increasing technical personnel required for livestock improvement work throughout India; and

(iv) The possibility of crop planning for increased fodder production with special reference to leguminous fodders.

With a view to facilitating discussions, the Council prepared notes on the above subjects. The Conference adopted certain important resolutions which are reproduced in Appendix II.

(vi) *The first All-India Cattle Show*, was held in February 1938 in New Delhi and was opened by H. E. the Viceroy who also presented the prizes. The purpose of the Show was to demonstrate the valuable material already available in this country for livestock improvement work and also to stress the potentialities of the Indian breeds of cattle. Such shows, besides providing the necessary stimulus to improvement, by encouraging competition between breeders in order to raise gradually the stock to the highest levels of efficiency for the particular functions they are required to perform, also help to stimulate trade in livestock and livestock products. Col. Sir Arthur Olver, the Animal Husbandry Expert, who was Chairman of the Show and the Secretary S. Santokh Singh, left no stone unturned to make the event a great success. The organisers succeeded in enlisting the sympathy and co-operation of high and distinguished personages. Twenty-nine magnificent Challenge Cups were offered for open competition, including one presented by His Excellency the Viceroy for the best animal in the Show. Several Indian States and Provinces, provincial departments, Central Government farm and private breeders co-operated actively and the following representative breeds were on view:—

Amritmahal, Bhagnari, Deoni, Dhanni, Hissar Hansi, Gir, Hariana, Kankrej, Khillari, Hallikar, Krishnavalley, Malvi, Mehwati, Nagori, Nimari, Rath, Red Sindhi, Sahiwal, Tharparkar, Jaffarabadi Buffalo, Mehsana Buffalo, Murrah Buffalo and Nili Buffalo.

A number of the best animals were sold at the Show, at prices up to Rs. 500 for a bull and Rs. 325 for a cow. A valuable addition was the Special Bulletin by Col. Sir Arthur Olver, C.B., C.M.G., F.R.C.V.S., which contained a brief description with photographs of representative of twenty-five of the best known breeds. A supplement to this containing new photographs and measurements taken at the Show is under preparation. The bulletin is now being issued in the principal vernaculars.

A very general desire was evident that the Show should in future be an annual function. Funds have been provided by the Government of India and the next show will take place in Delhi in February 1939.

8. *Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry.*—In the last year's report was published a summary of the more important recommendations made by the Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry at their second meeting in Madras and of the action taken on them by the Council. The developments which have occurred since are briefly outlined below:—

(i) *Castration, Vaccination, etc.*—The recommendations made by the Animal Husbandry Wing as regards castration, vaccination, etc., were commended to Provinces and Constituent States of the Council for suitable action. The replies received show that these recommendations were generally acceptable.

(ii) *Rinderpest.*—The recommendations of the Animal Husbandry Wing were communicated to the Provincial Governments and Costituent States of the Council for information and such action as they considered necessary.

(iii) *Diseases produced by Anærobes.*—The Board recommended the appointment of an officer, with special knowledge of pathogenic Anærobes to carry out investigations with particular reference to Blackquarter in cattle. A research scheme on these lines has since been received from the Madras Government and is under the consideration of the Council.

(iv) *Incidence and Control of Disease among Sheep and Goats awaiting Exportation.*—In pursuance of the recommendations made by the Animal Husbandry Wing, the Directors of Veterinary Services in the Provinces and in Hyderabad were asked to instruct the Veterinary Investigation Officers provided by the Council to carry out further investigations in this matter. When complete information is available it will be possible to determine which particular diseases are important from the point of view of export and what measures are necessary for their control.

(v) *Establishment of Quarantine Stations.*—In pursuance of the recommendation made by the Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry, this question was further considered by a special committee of the Advisory Board and by the Board. After a full discussion, the following conclusions were arrived at:—

(*a*) that there was definitely a hope that some at least of the lost trade in livestock would be retrieved, if proper quarantine stations were established at important ports;

(*b*) that the expenditure involved in establishing and maintaining suitable quarantine stations at a limited number of ports would be justified;

(*c*) that quarantine stations should be established at the ports of Bombay, Calcutta, Madras and Karachi;

(*d*) that the bulk of the expenditure involved should be borne by the Central Government; and

(*e*) that the quarantine stations should be utilized for import as well as export purposes.

These recommendations are at present under the consideration of the Government of India.

(vi) *Improvement of Sheep-breeding.*—The recommendations of the Animal Husbandry Wing in this respect were communicated to the Provincial Governments and the Constituent States of the Council and were brought to the notice of the Punjab States and Gwalior. From the replies received it appears that, except in Bengal and in the Travancore and Cochin States, suitable action for the improvement of sheep-breeding has already been, or is proposed to be, taken. In Bengal and in the two States mentioned above sheep-breeding on a large scale has been found to be impracticable for one reason or another.

(vii) *Cattle Dips.*—Before initiating any action on the establishment of demonstration cattle dips at all Government Cattle Breeding Farms, as recommended by the Animal Husbandry Wing, it was considered necessary to obtain information regarding the extent to which dips were already in use and the results so far achieved therefrom. The Provincial Governments and Constituent States were accordingly asked to furnish the necessary information. The Concrete Association of India was also requested to supply the Council with a design and an estimate of the

cost of cattle dipping tanks. The Association was further asked to state what facilities they would give in order to encourage the provision of dips in this country. The replies received in response indicate that cattle dips are not in general use but facilities exist at the Agricultural Sub-station at Karnal, the Hosur Livestock Research Station and the Central Vaccine Institute, Nagpur. In Bombay there are dips in the Vaccine Department, Belgaum, the Cattle Breeding Farm, Betegaon, Turkewadi the Government Cattle Farm, Bankapur and the Cattle Breeding Farm, Chharodi. Dips are also in use in Military Dairy Farms but no dips are in use in Military Veterinary Hospitals in India. The cost of the design supplied by the Concrete Association would be between Rs. 700 to Rs. 750. It may be mentioned in this connection that the Council has already allocated funds for a scheme for research into the best methods for the control of ticks in Bombay Presidency.

(viii) *Branding of Animals.*—The recommendations of the Animal Husbandry Wing in this respect were communicated to all Provincial and State Governments with a request to bring it to the notice of all concerned.

(ix) *Classification of Working Animals.*—As stated in the last year's report it was decided to postpone the consideration of the question of the classification of working animals until the complete Cattle Survey Report had been received from the Agricultural Marketing Adviser to the Government of India.

(x) *Classification of Wool.*—Very little work has been done so far in India as regards the scientific classification of Indian wool or the genetics of Indian sheep. Some analyses of wool are, however, being made in connection with the marketing survey of wool which is now in progress.

(xi) *Fodder Crops.*—In the previous report it was stated that the questionnaire prepared by the Animal Nutrition Committee on this subject was to be examined by a Sub-Committee of the Advisory Board. This has now been done by the Central Fodder and Grazing Committee who were of the opinion that it would serve a more useful purpose if the relevant information were collected in the form of tabular statements instead of as replies to a questionnaire. The tables have been prepared and circulated to Provinces and States for further necessary action.

(xii) *Equine Abortion.*—The Director, Imperial Veterinary Research Institute has been asked to collect all relevant information from horse-breeding studs in India, the Directors of Veterinary Services in India, and the Director of Veterinary Services, Burma, and pass it on to the Specialist Officer proposed to be appointed at the Institute for the study of contagious abortion of cattle, sheep and goats.

(xiii) *Mineral feeding.*—Relevant extracts from the proceedings of the Animal Husbandry Wing, and prevention of diseases were communicated to the Director, I. V. R. I., Mukteswar. The Officer in charge of the Animal Nutrition Section, I. V. R. I., Izatnagar, is expected to undertake some experimental work on this subject as soon as the laboratories of the Section are completely equipped.

(xiv) *Development of the Dairy Industry.*—With a view to developing high milk yielding strains of the more important breeds of Indian

cattle, the question of the formation of milk recording societies, together with the kindred subject of the formation of breed societies, was discussed by the Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry, the Board held that the time was ripe for the formation of breed and milk recording societies as an aid to developing the dairy industry in India. In his report Dr. Wright has emphasised the necessity for the establishment of a system of milk records.

Action has already been taken by the Council for the establishment of Pedigree Herd Books for the more important dairy breeds of cattle. As regards milk recording societies, although it is essentially a matter which should develop provincially, the Advisory Board considered that the Council should take the initiative. They accordingly recommended that:—

(*a*) Work should be started to begin with in the home districts of the 8 breeds in respect of which herd books are being established by the Council,

(*b*) milk recorders should be appointed in each of the selected areas with a special recorder at the headquarters of the Council who would visit all recording centres and check the results,

(*c*) the constitution of the societies should be left to the Provinces, and

(*d*) half the cost should be borne by the Imperial Council of Agricultural Research for a limited period.

These recommendations have been accepted and enquiries have been made from the Provincial Governments concerned whether they agree to the proposals.

(xv) *Registration of Dairy Cattle.*—Relevant extracts from the proceedings of the Dairy Sub-Committee, as approved by the Animal Husbandry Wing of the Board, were forwarded to all Provincial Governments and Indian States constituent to the Council, with the suggestion that official registration of buffaloes might be started with a view to their improvement in places where well-defined breeds of buffaloes existed. The registration of animals will also be effected under the proposed system of maintaining Pedigree Herd Books to which a reference has been made elsewhere.

(xvi) *Buffaloes in the Dairy Industry.*—A reference was made in the last year's report to the importance of buffaloes in the dairy industry. The result of the village enquiry into milk production and consumption confirms the necessity for devoting more attention to the improvement of the important breeds of buffaloes. In the seven areas where the enquiry was conducted it was found that the average daily milk yield from buffaloes was twice as high as that of the cows. It was also found that though under village conditions both buffaloes and cows calved at intervals of about 18 months in the average, the average dry period for buffaloes was eight months compared to nine months for cows.

(xvii) *Burdizzo Castrator.*—The recommendation made by the Animal Husbandry Wing about the utilization by the villager under veterinary supervision of this instrument was brought to the notice of Provinces and Constituent States who were requested to furnish reports of the progress made in its adoption.

(xviii) *Statistical Methods in Livestock Research.*—The Statistician to the Council (Rao Bahadur M. Vaidyanathan) has prepared a note on this subject which will be published shortly, and will deal with the elementary aspects of statistics in relation to veterinary and animal husbandry problems, and will deal particularly with the planning of experiments and the statistical interpretation of the results. It is hoped that the note will be of help to veterinary and animal husbandry research workers. It is proposed to include lectures on statistical methods in the syllabus for post-graduate students at the Imperial Veterinary Research Institute in future.

9. *Report by Dr. N. C. Wright on the development of the cattle and dairy industry in India.*—(i) *General.*—Reference was made in last year's report to the scientific survey on the development of the cattle and dairy industry in India which was then being carried out by Dr. N. C. Wright, Director of the Hannah Dairy Research Institute, Ayrshire, Scotland. The report was published on 22nd September 1937 as a sale publication. It was very well received by the press and by the public and the number of comments from the public as well as from business interests followed in its publication testifies to the wide interest it has aroused. Not only does the report survey the progress made on the research schemes financed by the Council but it also defines the policy to be followed and states clearly the most profitable lines of development for the Indian dairy industry and indicates where research is needed. It emphasises the need for an entirely new outlook and technique and emphasises the need of more experimental work on indigenous milk products and under village conditions. The recommendations cover a wide range many being matters involving action by the Government of India or Provincial Governments rather than the Research Council. Those which concern the Central Government are under examination by the Government of India. The Government of India have accepted the recommendation that an adequate Central Dairy Institute for higher teaching and research should be provided.

The recommendations which directly concern the Council and the action taken on them are indicated below:—

General recommendations—

(*a*) *Provision of facilities for the improved marketing of ghee and the establishment of grading centres.*—This is dealt with more fully in the report of the Agricultural Marketing Adviser.

A marketing survey for milk and milk products was started in 1935 and is largely complete. The grading and marking of ghee has been started and satisfactory progress been made. The report on the milk marketing survey is now nearly complete. Adviser.

The Council provided a grant for experimental marking and grading of ghee and two small experimental grading and marking stations are in operation.

(*b*) *Investigation of the nutritive value of indigenous milk products.*—This recommendation is under the consideration of the Nutrition Committee of the Indian Research Fund Association. It is probable that work on the nutritive value of milk products will have to go hand in hand with experimental work on the products themselves.

(c) *Establishment of pedigree Herd Books and Milk Recording Societies with a view to the breeding of cattle having a high milk yield.*—As previously stated, work has already been started in regard to the definition of the characteristics of eight important breeds of Indian cattle. Reports defining the characteristics of the Kankrej, Ongole, Tharparkar and Gir breeds have already been received and the other reports are expected to be ready shortly.

The steps taken to promote milk recording are detailed in para. 13(v).

(d) *Survey of the incidence of the mineral and vitamin deficiency diseases of cattle.*—This matter has been considered by the Fodder and Grazing Committee. Further investigations are needed.

(e) *Award of scholarships for post-graduate training in animal genetics.*—In connection with the proposed establishment of a Genetics Section at Izatnagar, a small number of trained geneticists will be required. Dr. Wright suggested in his report that the Imperial Council of Agricultural Research should consider the question of awarding one or two scholarships to enable promising post-graduates to obtain the necessary research training overseas. This recommendation has been accepted in principle by the Council and details are being worked out.

(ii) *Dairy Training.*—Reference was made in the previous report to the revised draft syllabus for the I. D. D. course. Further action was deferred pending the receipt of Dr. Wright's report. Dr. Wright has recommended that:—

(a) the I. D. D. course is useful, provided that more attention is paid to indigenous milk products, cheap equipment and co-operative methods of production and distribution;

(b) that such instruction should be given at the Provincial Agricultural Colleges and not at the Central Dairy Institute and that the number of centres should meantime be limited. Uniformity in the standard of instruction should be ensured by the appointment of a special committee to prescribe standards of instruction and examination; and

(c) post-graduate training should be provided at the Central Institute where the course should be designed to suit Indian requirements.

The Advisory Board discussed these recommendations and accepted them, subject to the condition that the present courses at the Allahabad Agricultural Institute and the Imperial Dairy Institute, Bangalore, should be continued for a reasonable period.

These recommendations are now under the consideration of the Government of India and Provincial Governments.

(iii) *Imperial Dairy Research Institute.*—Dr. Wright has recommended that the existing Imperial Dairy Institute at Bangalore should be transferred to a more central place and reconstituted as an Imperial Dairy Research Institute which should be adequately staffed and well-equipped for conducting research into the many problems associated with the Indian dairy industry. He has further suggested that such an institute should have four main sections, *viz.*, (i) Dairy Bacteriology, (ii) Dairy Chemistry, (iii) Dairy Technology and (iv) Dairy Husbandry. These recommendations are being considered by the Government of India.

(iv) *Anand Creamery.*—Mention was made in the previous report of certain proposals for research on the processing and handling of milk at the old Anand Creamery. The Council is interested in a scheme for research at the Creamery on the products and by-products of milk at an approximate cost of Rs. 1 lakh. Dr. Wright has recommended that if the proposed Central Dairy Institute is established, the need for a separate experimental creamery such as that proposed at Anand will not arise. The Governing Body of the Council at their meeting held in March last, considered the recommendation and agreed to defer consideration till their next meeting. If by that time it is known that a Central Dairy Institute will be established, the present scheme may be dropped. As mentioned above the Government of India has accepted the recommendation that an adequate central dairy institute should be provided.

(v) *Central Record Officer for Pedigree Registration.*—In his report Dr. Wright has laid special stress on pedigree registration and milk recording as these are the two factors which have exercised the most profound influence on the improvement of livestock in all countries of the world where livestock wealth has been most successfully exploited. It is in fact clear from the publications of the International Institute of Agriculture and from the recommendations of the International Dairy Congress 1937 that the improvement of livestock has been most marked in those countries where pedigree registration and milk recording are most highly developed. Recognising the importance of the establishment of Herd Books and of the system of milk-recording the matter has been discussed at various meetings of the Cattle Breeding and Dairying Committee and by the Advisory Board of the Imperial Council of Agricultural Research, as well as by the Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry. Conveners appointed for the committees set up to define the breed characteristics of eight of the most important breeds of milch cattle in India. The great interest which was taken at the recent All-India Cattle Show in pedigree stock possessing milk records, and the high prices which were realized for those sold are further indication of the commercial importance of this work.

10. *Miscellaneous Animal Husbandry subjects.*—(i) *The Central Fodder and Grazing Committee.*—In pursuance of the recommendation made by the Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry and a similar recommendation made by the Cattle Conference, the Imperial Council of Agricultural Research have set up a Central Fodder and Grazing Committee as a Standing Committee of the Council. The personnel of the Committee which consists of representatives of provincial Forest Agriculture and Veterinary Departments, will be found in Appendix XII.

The first meeting of the Committee was held in November 1937. A summary of the more important discussions held and decisions reached is given below. Preliminary action in regard to all recommendations made has been initiated by the Council:—

(1) It was decided to prepare bibliographies about (*a*) Indian grasses, grasslands and fodder trees; (*b*) erosion as connected with the grazing problem and (*c*) work in India on feeding tests.

(2) The Committee recommended that, as at present it is hardly possible to make any estimate of the amount of food available for animals from different sources, the provincial committees should be asked to collect the desired information and to formulate a standard scheme for collecting information under this head. As it is not possible to estimate the total food supply till the survey of grassland in each province is made, it was decided that an estimate of the cultivated fodders only should be prepared first.

(3) The Committee recommended that the revision of the Section on Grasses for the flora of the Gangetic plain by Mr. Parker should be completed.

(4) The Committee proposed that outlines for experiments in the improvement of grazing lands should be suggested to provincial committees. The Agricultural Expert to the Council drew up a short note on this point. The suggested experiments were considered to be extremely simple and more or less on the lines of Sir John Russell's recommendations regarding experiments to be carried out on cultivators' holdings. It was also intended that some uniform methods should be adopted in these trials. Statistical significance was not considered necessary but such sampling as was done should be arranged according to commonsense statistical methods.

(5) Reference was made to the recommendations made by Dr. Wright in his report in regard to fodder and grazing problems. According to Dr. Wright in any comprehensive grassland surveys accurate studies of mineral requirements and the mineral analysis of fodders are necessary. The report also stresses the need for a very much greater attention to growing special fodder crops. It was decided to make the following recommendations to the Provincial Committees:—

(i) breeding of quick growing fodders,

(ii) possibility of fodder-growing in rotation and cutting it young, and

(iii) importance of carrying on investigations on the fodder value of pulses.

(6) The Committee also considered the reports of the "India" delegates to the International Grassland Conference held at Aberyswyth in 1937.

(7) In order to establish and maintain a liaison with the Imperial Bureau of Plant Genetics the Committee considered it desirable that the Bureau should be kept in touch with the activities of the Central Committee. The Provincial Committees should keep the Central Committee informed of such correspondence as passed between them and the Bureau.

(8) The question of the various methods of the improvement of grassland and the possibility of breeding better strains of indigenous wild fodder grasses were discussed. The Committee considered that it was desirable to carry out experiments in re-seeding and re-planting and that the work of selecting better types of grass should be carried out as there was an extensive range of types within the species of indigenous grasses.

(9) The question of the possibility of clearing suitable areas in pole forests for fodder cultivation was discussed and the Committtte passed the following resolution:—

> "The Central Fodder and Grazing Committee strongly approves of the scheme by the United Provinces Forest Department for making a prelminary survey for, and to examine the possibilities of, creating fuel and fodder plantations in the plains districts. The method to be employed (forestry-*cum*-agriculture, known as "taungya" in the United Provinces) has proved in forest areas most beneficial to the cultivator as a means of supplying poles, firewood and fodder, also giving good land for cultivation and at the same time allowing of regulated forest development. The possibility of applying this system to lands remote from forests and in private hands, is now to be explored. The Central Fodder and Grazing Committee commends this method for consideration in other parts of India also".

(10) The Committee agreed that experiments should be carried out on ensilage of grasses and, to begin with, Terai grasses should be taken.

(11) The seriousness of the risk of spread of rinderpest and other diseases by uncontrolled grazing in forests was stressed by the Committee and it was considered that the chief remedy lay in inoculating the herd, an expedient which is only possible where grazing fees are charged. The Committee passed a resolution to the effect that wherever the reduction or abolition of grazing fees is contemplated this danger should be kept prominently in view and some effective measure taken to check overstocking. It was suggested that where grazing fees are to be reduced such reduction should be limited to—

(i) animals protected against rinderpest, and to

(ii) approved breeding bulls.

(12) The question of whether or not facilities for grazing of goats could be provided was discussed and the Committee considered that it would not be desirable to admit goats into any kind of forest areas. They could best be fed on cultivated fodders and by suitable loppings.

(13) It was considered necessary that a survey of grassland should be carried out in the Provinces and that where an agrostologist was not available the task should be taken up by the consulting Botanist to the Provincial Government.

It is hoped that with the establishment of Fodder and Grazing Committees in all the Provinces it will be possible to co-ordinate work and to carry on intensive investigation on the problems of fodder in India. At present only the United Provinces and Assam Governments have set up

provincial Fodder and Grazing Committees. Other Provinces have been asked to set up their own Committees as early as possible.

(ii) *Control of disease among livestock.*—The draft bill for the control of diseases among livestock and the revised draft of the rules proposed to be made thereunder were considered by an *ad hoc* committee and by the Advisory Board of the Council. The necessity for having some provisions to form the basis of a campaign for the co-ordinated control of livestock diseases in the country was accepted. The situation has, however, changed in view of the present constitutional position necessitating a re-examination of the proposal. The matter is at present under consideration.

(iii) *Central Veterinary College.*—A somewhat detailed statement containing information regarding the proposal for the establishment of a Central Veterinary College for imparting higher training in Veterinary Science was included in the previous year's report. Further action in the matter is now being taken by the Government of India.

(iv) *Adulteration of dairy products.*—In last year's report, mention was made of a proposal to draw up a code which might form a useful guide to Provinces and States. It is realized that the prevention of adulteration is purely a provincial matter and anything which may be done in this respect is likely to affect more than one Act in each Province. In particular standards of purity of food and the prevention of adulteration are provided for in Provincial Pure Food Acts, while matters like the licensing and control of dairies, cowsheds, etc., are covered by Municipal and Local Self-Government Acts which differ materially from Province to Province. All that is possible, therefore, is to state what is considered to be technically necessary and feasible and to invite the Provinces and States to consider the possibility of bringing their acts, rules and bye-laws into line.

Another matter also has a bearing on the subject. A Central Act, the Agricultural Produce (Grading and Marking) Act, 1937, has recently been enacted under which grading has now a definite legal meaning. Dairy produce is included in the schedule to this Act and rules for the grading and marking of ghee have been worked out and will shortly be made and grade-standards prescribed.

The object in view should therefore be to secure the greatest practicable measure of uniformity in the bye-laws of the various Provinces, especially in regard to measures to prevent—

(*a*) the sale of adulterated or misbranded milk and milk products;

(*b*) the inspection of dairy farms, cowsheds, milk-shops, milk-plants and premises where milking is undertaken, and

(*c*) the licensing of milk products, distributors and milk vendors, the conditions of the grant and revocation of licences; and to prescribe the conditions under which milk intended for sale is to be produced.

A draft set of model rules has been prepared and is now under consideration.

(v) *Uniform system of milk recording.*—It would greatly facilitate the improvement of dairying in India if a uniform system of milk recording were adopted for dairy herds throughout the country. With this object in

view draft forms for milk recording were prepared. The Standing Dairying Committee at its meeting held in February 1935 decided that before adopting these forms, their suitability for general use should be tested by practical trial on farms in various parts of India. Accordingly the forms were circulated to Provincial Governments and private dairies. The form provides for detailed information regarding the pedigree, record of weight from birth to maturity, diseases, movements, monthly milk yield, dates of calving, lactations and live weight. The reports received show that, while the forms are generally suitable, their utility can be enhanced by minor modifications. These are being considered by the Dairying Committee.

(vi) *Inspection of Meat.*—As stated in the previous report certain draft rules for meat inspection were circulated to Provinces and the Constituent States for opinion. The draft rules were considered by an *ad hoc* Committee and by the Advisory Board of the Council in the light of the opinions received from the provinces and States. As central legislation is not possible it was considered desirable to prepare a model set of rules which could be adopted by Provinces and States with any modifications considered necessary to suit local conditions. It was, however, held that the rules should not be circulated to the Provinces and States in their present form, as they were primarily based on "foreign" as opposed to "Indian" conditions. It was accordingly decided to have the rules re-examined. The Agricultural Marketing Adviser to the Government of India has since submitted a detailed note containing his suggestions in this respect. The draft rules are under re-examination in the Imperial Council of Agricultural Research.

(vii) *Angora goat-breeding.*—The proposal to investigate the possibility of rearing Angora goats in India especially in the North-West so that it may be possible to start a Mohair industry has been under consideration for some time. The intention is that an experienced livestock officer of the Punjab Government should be deputed to South Africa to study the problem. The officer for the purpose has been selected. His departure has been postponed till the end of the calendar year 1938.

(viii) *Apiculture.*—An attempt has been made from time to time to get something done for bee-keeping which is a promising cottage industry for some tracts. A number of schemes of research on improved methods of bee-keeping have been received but the majority of them were considered to be somewhat impractical. The question of concentrating research at one or two suitable centres is now being considered.

The Council sanctioned a grant for the deputation of an officer of the Punjab Agricultural Department for a year's training in apiculture in America. On his return this officer has been placed in charge of two bee-farms started by the Punjab Government.

(ix) *Milk supply in Calcutta.*—At the request of the Corporation of Calcutta the Council has set up an Expert Committee to investigate the prevailing conditions as regards milk supply in Calcutta and to suggest measures for its improvement as well as for the improvement of livestock in Calcutta. The Committee is about to start its work.

(x) *Prizes for inventions of distinct merit in Dairying and care of animals.*—With the object of stimulating invention and design the Council offered a gold medal and silver medal for inventions of distinct merit in

Dairying and the care of animals. In response to this announcement the following entries were received, *viz.*—

(1) A combing machine.

(2) A hot air apparatus for drying grass.

(3) An improved yoke, and

(4) A ghee boiler.

These were put through practical tests and the results examined by an expert sub-committee. None of the appliances entered were found worthy of an award.

(xi) *Investigation into the efficacy or otherwise of the indigenous system of treatment of cattle in India.*—In pursuance of a resolution adopted by the Governing Body, at a meeting held in December 1937, the question of undertaking an investigation into the efficacy or otherwise of the indigenous systems of treatment of cattle in India, and the collection of literature relating to such systems, was examined by a Veterinary Committee and by the Advisory Board. It was decided that the first step should be to collect and sift all the existing information on the subject both as regards the actual drugs used and the methods of treatment adopted by experienced and enlightened stockbreeders throughout the country. Such information is now being collected. The Advisory Board also recommended the appointment of a qualified Veterinary Officer for a period of six months to study the question in selected areas such as Orissa and Travancore. This is under consideration.

(xii) *Horses, Mules and Asses.*—An attempt is being made to collect and collate all available information regarding the indigenous breeds of horses and asses in India and Burma including particulars of breed characteristics. The information collected will be published in due course.

(xiii) *Improvement of camels.*—Although camels are extensively used as back animals for riding purposes and for agricultural purposes little systematic work has been done so far for the improvement of breeding. As a first step information is being collected from the camel-rearing tracts of India regarding the various breeds of camels found, their breed characteristics and feeds, the way in which they are usually bred and other relevant matters.

(xiv) *Phooka.*—Recently there has been a welcome strengthening of public opinion in favour of more comprehensive legislation to stop this pernicious and inhuman practice by suitable legislation. The matter has been under the consideration of the Government of India at whose disposal the Council placed all relevant information available on this subject. A bill to check this malpractice (by suitable amendments to the Act for the prevention of Cruelty to Animals) was introduced by the Government of India in the Central Legislature during the Delhi Session 1938. The bill has since been circulated by the Government of India to Provincial Governments for eliciting their comments.

(xv) *Propaganda in Animal Husbandry matters.*—Arrangements have been made for the purchase of cinema films of the All-India Cattle Show 1938 and of a shorter film illustrating the principal breeds of Indian cattle as there exhibited. These films will be available for loan to live-stock departments.

(xvi) *Helminthological Research.*—In 1933 a co-ordinated scheme of research in this subject was drawn up by a special Helminthological Committee, in order to obtain more precise information about these parasites which cause heavy losses to live-stock in India. The Committee suggested that the necessary identifications and detailed examination of materials received from various parts of India should be carried out at the following institutions which have agreed to co-operate, *viz.*, (1) The Madras Veterinary College, (2) The Lucknow University, (3) The Imperial Veterinary Research Institute, Mukteswar, and (4) The Nagpur University. Material collected for the purpose will be sent to the appropriate centre according to a regional distribution. The recommendations were accepted by the Council Board and research work is now being carried out at the first three centres and arrangements are in progress for starting work at Nagpur.

(xvii) *Poultry Diseases.*—At their meeting held in November 1937, the Advisory Board laid emphasis on the fact that in view of the economic importance of the poultry industry in India and of the fact that the combating of poultry diseases is a pre-requisite to the successful working of poultry-breeding schemes in this country, research work on the diseases of poultry should be given preference over poultry-breeding schemes. It was further recommended that in order to take full advantage of the specialist officer to be appointed for work on poultry diseases at Izatnagar, an investigation officer who can collaborate with him is needed at each Veterinary College, or other suitable veterinary laboratory, in the various Provinces and States. The views of the Government concerned have been invited.

(xviii) *Standardisation of methods for analysis of mineral contents of fodders and feeding stuffs.*—There is a demand for a bulletin describing the most suitable methods for use in the analyses of fodders and feeding stuffs for mineral content and for the adoption by all research workers in the subject of certain standard methods in order that their results may be comparable. A note prepared by Dr. P. E. Lander and Dr. K. C. Sen, dealing with the standard methods which were considered suitable for use in the Council's schemes, was considered by the Advisory Board in November 1937 and has been circulated to nutrition research workers engaged on schemes financed by the Council. A note on the subject will be published shortly.

(xix) *Animal Husbandry Bureau.*—The Bureau continued to function satisfactorily during the year and considerable progress was made in the collection, collation and publication of data relating to animal husbandry matters. Some of the more important items of work done during the year are enumerated below:—

(*a*) Village enquiry regarding cattle and the production and consumption of milk.

This has been referred to in para. 7 (iv).

(*b*) The milk records collected during the previous year were collated and the first instalment comprising records for one year was sent to the press. It is expected that copies will be available shortly to the public. Meanwhile material for the current year is being collated.

(*c*) A paper on the influence of accessory factors on the production of milk by Indian goats was published in *Agriculture and Livestock in India.*

(*d*) Some photographs and other data relating to Indian breeds of cattle which had been collected by the Bureau, were utilized for the special Livestock Bulletin (Miscellaneous Bulletin No. 17 of the I. C. of A. R.) prepared by the Animal Husbandry Expert to the Council.

(*e*) Indexing of important papers, compilation of statistics of mortality, inoculations, etc. were carried on as outlined in previous reports.

(*f*) Further investigations into problems of importance to dairymen were started during the year by carrying out a careful analysis of the large mass of data which has accumulated in the records of Government Military Dairies in India. The most important item is the relation of the growth rate of female calves to their milk production as adults. This should incidentally indicate the optimum growth rates to be aimed at for dairy calves under Indian conditions. Other items include the relation of peak yield to total lactation yield; the influence of season on the efficiency of milk production; and the correlation between milk yield and susceptibility to disease. Work was started in January 1938. The Council wishes to record its appreciation of the whole-hearted and continued co-operation which the Military Farms Department have extended to it in carrying out investigations of this kind.

(*g*) The Bureau rendered considerable assistance at the All-India Cattle Show in recording the milk yields and measurements of the cattle exhibited. These will be compiled and issued as a Supplement to the Special Livestock Bulletin referred to under (*d*) above.

(xx) *The Eleventh World Dairy Congress 1937.*—India was represented in the Congress by a delegation consisting of Sardar Bahadur Datar Singh and Messrs. F. Ware, E. J. Bruen and F. J. Gossip. A joint report submitted by the delegates was presented to the Standing Dairying Committee. The report shows that the deliberations of the Congress covered such diverse topics as hygiene, production of milk, uniform standard of testing milk, need for standardised herd books, pasture and grazing, stable hygiene, control of cattle diseases, and dairy education. The Congress adopted a resolution that at future meetings of the Congress Tropical Dairying should form a special section.

The Standing Dairying Committee recommended that—

(*a*) the Council should consider whether arrangements could now be made for membership of the International Dairy Federation, and

(*b*) the Government of India might also be invited to consider whether it was now possible for it to take up governmental membership,

These recommendations are under consideration.

The Committee also recommended that in view of its interest to the public, the joint report should be published in "Agriculture and Livestock in India", and illustrated by suitable photographs. This is being done.

(xxi) *The Thirteenth International Congress of Veterinary Medicine.*—The Thirteenth International Congress of Veterinary Medicine will be held at Zurich and Interlacken from the 21st to 27th August 1938. It has been decided that India should participate in the Congress and that the delegation should consist of Col. Sir Arthur Olver (Leader of the delegation) and Messrs. P. J. Kerr (Director, C. V. D., Bengal), T. S. Davis, (Superintendent, C. V. D., United Provinces), J. H. G. Jerrom (Director of Vety. Services, Sind) and Captain S. C. A. Datta (Officer in charge of Protozoology, Imperial Veterinary Research Institute) as Rapporteur. The necessary funds have been provided by the Council for Captain Datta's deputation.

There is also a proposal that a preliminary conference of veterinary officers of the British Empire should be held in London, immediately before the opening of the international congress. Arrangements are being made to enable the delegates from India to take part in this conference.

(xxii) *The Fourth International Grassland Congress.*—As stated in the previous year's report the Council deputed Professor L. S. S. Kumar, Economic Botanist to the Government of Bombay, to attend the Fourth International Grassland Congress which was held at Aberystwyth in July 1937. Messrs. J. A. Wilson, E. J. Bruen and E. A. H. Churchill also attended the Congress on behalf of the Governments of Madras, Bombay and the Central Provinces and Berar, respectively. Reports were received from Prof. Kumar and Mr. Bruen and submitted to the Central Fodder and Grazing Committee at their first meeting held in November 1937.

Both the discussions at the Congress and the instructive tours to important herbage and fodder research centres were of practical value and the delegates had the opportunity to get in touch with those interested in all phases of work on grassland improvement.

(xxiii) *Third International Congress for Microbiology.*—In connection with the proposed Third International Congress for Microbiology to be held at New York, from the 2nd to the 9th September 1939, a request was received for the supply of names of Microbiologists who would be able to contribute papers at the Congress and for giving publicity. Both the requests have been complied with.

(xxiv) *Indian Science Congress.*—The twenty-fifth Annual Session of the Indian Science Congress was held at Calcutta from the 3rd to 9th January 1938. This was the Jubilee Session of the Congress and eminent British Scientists of international reputation attended the Session and took part in its deliberations. Col. Sir Arthur Olver, Animal Husbandry Expert, Imperial Council of Agricultural Research, was President of the Veterinary Research Section and several of the Council's officers attended the Session.

(xxv) *Revision of Tables.*—It was mentioned in the last year's report that, for the sake of uniformity, and in order that they may be more useful, the various tables appended to the annual reports of Civil Veterinary Departments of Provinces and Constituent States had been revised. It is understood that the revised forms will be introduced.

11. *Veterinary, Animal Husbandry and Dairying.*—(i) *Goat Breeding at Etah.*—Reference was made in the previous Report to the progress made under the goat-breeding scheme at Etah. The report for the year 1936-37 shows that further improvement in the milk yield of the stock maintained on the farm has been effected and that the cost of production of milk per pound has been steadily reduced, the cost during the period under review coming down to 7·4 pies per pound. Unfortunately, towards the close of the year 1936, goat pox and an undiagnosed disease broke out in an epidemic form among the herds at the farm and caused heavy mortality.

Dr. N. C. Wright who paid a visit to the farm on the 1st March 1937 reported favourably on this scheme and remarked that the soft cheese prepared on the farm was of excellent quality.

(ii) *Punjab Parasitological Research Scheme.*—The report for the year ending September 1937 showed that valuable information has been obtained in regard to the practical control of parasitic infestations in the field. Experimental work showed that the provision of a balanced ration helped greatly in the spontaneous elimination of parasites. The deficiency of minerals which had been found in the grass obtained from the affected area probably had an important bearing on the degree of infestation. Precise information as regards the comparative efficiency of certain lines of treatment has also been obtained. The scheme terminated in September 1937 and the results are being published in the *Indian Journal of Veterinary Science and Animal Husbandry.*

(iii) *Animal Nutrition Research Scheme, Dacca.*—The report of the work done under the scheme up to the end of the last financial year shows that further experiments were conducted with water hyacinth, Napier grass, Aman paddy straw, Aus straw and Boro straw. Methods for the estimation of minerals in fodders, fæces, etc., were also tested. The additional staff sanctioned for the scheme was dispensed with from the 1st October 1937, their term having expired on that date.

(iv) *Veterinary Investigation Officers.*—The reports of the Veterinary Investigation Officers in the Provinces and Hyderabad State for the year 1936-37 shows that, as work proceeds, the information obtained is becoming more and more precise and of greater value. As a result of systematic investigation it is now clear that surra in bovines is wide-spread in India but, though often present, it does not usually cause heavy mortality unless there is a high incidence of biting flies and animals are subjected to severe strain.

The Committee which considered these reports recommended that now that Rinderpest is to a large extent under control, more attention should be given to the control of Foot and Mouth disease and Anthrax.

Besides Rinderpest, which continued to be one of the most important items of investigation, the following diseases were investigated:—

Anthrax, Enzootic Haematuria Bovine Mastitis, Contagious Abortion, Tuberculosis, Johne's Disease, Horn Cancer etc.

Diseases of sheep, goats and poultry also received a good deal of attention during the year under report. Equine diseases, including equine encephalomyelitis and equine surra, also formed an important part of the investigations, particularly in Bihar.

During the year under review the scheme was extended to Sind and Orissa. The Officer in Sind has already started work and a Veterinary Investigation Officer has been recruited for Orissa. With the addition of these new links the chain of research organization throughout the length and breadth of the country has been strengthened.

The original scheme was sanctioned for most Provinces and for Hyderabad State, up to the 31st March 1938 and it has now been extended for another year. In view of the great importance of the work which is being undertaken the Council has recommended to Government that this organization should be placed on a permanent basis. This question is now under consideration.

(v) *Research into the composition of milk at the Allahabad Agricultural Institute.*—The report on the working of the scheme for the period from 1st July 1936 to 31st March 1937 has been received and considered by the Council. For this investigation 42 milking animals of varying ages and calving at different times were taken to constitute a typical herd. The herd contained Sindhi cows, Holstein-Sindhi cows, buffaloes and village cows. Analyses were made on 447 samples of milk. In addition, freezing point determinations and examination of the composition of ash were made on samples from 30 animals. Further work is in progress.

(vi) *Johne's Disease Investigation—Mysore State.*—During the year 1936-37 systematic work was continued under three main heads—epizootological, bacteriological and therapeutical. An intensive survey of the incidence of infection among cattle in Bangalore city was undertaken. The progress of the bacteriological work continued to be satisfactory and special attention was paid this year to experimental treatment with Oleum Hydnocarpi (*chalmoogra* oil).

(vii) *Animal Nutrition research at Coimbatore.*—The report of the work done under this scheme during the year 1936-37 shows that further experiments were carried out on cows and calves after a period of stabilisation. Investigations on mineral metabolism and blood studies for mineral deficiency were taken up. Pasture surveys were carried out in the vicinity of Coimbatore, and in the Ongole area of the Guntur District, where the famous Ongole breed of cattle is raised. The biological value of cereals and red gram proteins was assessed and an investigation was commenced in poultry nutrition.

(viii) *Goat virus vaccination scheme (C. P. and Berar).*—Reference was made to this scheme in last year's report. The scheme continued to work satisfactorily and during the year ending 31st March 1937, 1,41,177 heads of cattle in about 806 villages were immunised with goat vaccine. The main problems dealt with included a study of reactions produced by different methods of vaccination in different localities, study of the value of goat virus in the control of actual outbreaks, resuscitation of protozoan diseases like Piroplasmosis, Theileriasis, Coccidiosis and their control. The scheme terminated in March 1938 and a report of the final results obtained from the investigations will soon be available.

(ix) *Research in warble flies at the Imperial Veterinary Research Institute, Mukteswar.*—At present attention is being devoted to the collection of information regarding the life-history and bionomics of warble flies in India. On the basis of the information received so far from the various Provinces

and States a map of India, showing the incidence and regional distribution of the warble fly, has been prepared by the Council. This is likely to be of much use in the course of the investigations to be undertaken.

(x) *Indigenous sheep breeding scheme, Punjab.*—In 1933 the sub-committee which examined the general position regarding sheep breeding in India recommended that systematic breeding work for the improvement of the more important indigenous breeds should be taken up on an extensive scale. One of the breeds considered to be sufficiently distinct and of considerable all-India importance for the purpose of effecting improvement was the Bikaner breed. It was also recommended that the Government Cattle Farm, Hissar was one of the most suitable centres for work on sheep. The Punjab scheme has accordingly been sanctioned in order to provide for research on the systematic improvement of sheep by careful selective breeding and to make available pedigree animals when required for improvement work in other Provinces. It is also contemplated to investigate the problems associated with mating, docking, etc., to demonstrate the classification of wool and to provide facilities for such other investigations as may be desired by the Council. Diseases of sheep will also form an important subject for investigation. The scheme has been in operation for about a year and a good stock of selected Bikaner rams has already been obtained.

(xi) *Feeding of cattle at Departmental Farms in the U. P.*—The object of the scheme is to study the values of cultivated fodder crops in production rations with growing and milking cattle. Analyses of the feeding stuffs used as well as those of milk and of the excreta and urine of cattle under observation are to be undertaken. A Research Officer has been recruited and it is hoped that it will be possible to start work shortly.

(xii) *Bombay Poultry Husbandry Research scheme.*—The first report on the scheme for the period ending 30th June 1937 shows that some progress has been made on the lines approved by the Council. Experimental feeding is being carried on by the substitution of *jawari*, for wheat and *jawari* mixed both as 'scratch grain' and in the mash; and also by the substitution of ground-bone (green) for dried fish which was formerly used as a source of animal protein in the diet. Ground-bone is considerably cheaper than dried fish which is not easily obtainable by common village folk. It is interesting to note that a method has been found to overcome tick infestation among poultry. With a high-powered spray and cheap kerosene oil it has been found possible to force this liquid into the cracks and minute crevices where these insects lodge. This knowledge is likely to be of the utmost importance in connection with the housing of poultry.

(xiii) *Scheme for the analysis of indigenous fodders in Bihar.*—The scheme was sanctioned for a period of 5 years and work started from the 1st November 1936. The scheme involves the analysis of the indigenous fodders of Bihar, for the purpose of determining the nature and extent of existing mineral deficiencies. A knowledge of the composition of the fodders grown in the province is likely to lead to a better understanding of the requirements of the local cattle. The technical programme of work under the scheme as approved by the Council includes the analysis of the various fodders grown in Bihar, the influence of age and soil on fodder, the seasonal variation in the composition of fodders and the effect of cultivation and manuring on the composition of fodders. Data are being collected and the various factors affecting the composition of fodder are being studied.

(xiv) *Scheme for the development of fresh water fishes in Bengal.*—Mention was made in the previous report of the progress made in the investigation of the life history and biology of fresh water fishes for human consumption. In the year under review experiments were carried on on natural and artificial feeding. Relative values of artificial food for yearlings have been ascertained and the problems of natural and artificial breeding has been investigated.

(xv) *Scheme for the improvement of poultry for table purposes in Northern India.*—The object of the scheme is to carry on investigations into the rearing and feeding of poultry under conditions similar to those prevalent in villages. Special attention is to be given to the optimum conditions for rearing young stock and feeding fowls for market purposes. The Asil, Chittagong and the Common indigenous mongrel fowl are the breeds which have been selected for purposes of the experiments. Preliminary work has been started and it is hoped that it will be possible to take up other aspects of problem in a short time.

(xvi) *Sheep-breeding scheme, Bombay.*—This is a part of the co-ordinated scheme which was drawn up by the Special Sheep Breeding Committee in 1933. The main breed of sheep to be experimented upon under this scheme is the Deccan Plateau Breed which is an important breed of sheep in India. The object of the scheme is to build up a pure stock of this breed and for this purpose the selection of foundation stock and subsequent mating will be done with a view to eliminating undesirables and providing a race suitable for production of better wool. The crossing, at a later stage, the Deccan Plateau sheep with the Merino is also contemplated. Special emphasis will be laid on the study of diseases and for this purpose the Officers of the Bombay Veterinary Department will be closely associated with the work and will be given every facility for disease investigation. The scheme started only recently and it will be some time before results can be expected.

(xvii) *Scheme for the investigation of Tuberculosis and Johne's disease at Mukteswar.*—There is considerable evidence to show that Tuberculosis infection in animals, particularly cattle, is wide-spread in this country. Johne's disease amongst cattle, an allied infection, is also prevalent in several dairy herds in this country, but information is lacking on many points, *e.g.*, the methods of its spread and control. For the investigation of these diseases, the Council sanctioned a scheme for the appointment of a research officer at the Imperial Veterinary Research Institute, Mukteswar. It has not, however, been possible to recruit a specialist with the requisite qualifications either in India or in the United Kingdom. It is now decided to depute an officer from India to the United Kingdom for the requisite special training and to employ him on return on the investigation in question.

(xviii) *Scheme for investigation into contagious abortion in cattle, goats and sheep at the Imperial Veterinary Research Institute, Mukteswar.*—One of the conditions laid down in connection with the scheme was that the recruitment of the officer thereunder should be made through the Federal

Public Service Commission and that if a suitable candidate was not forthcoming the matter should be reported to the Governing Body. The Commission having reported that no qualified candidate was obtainable the Governing Body decided that the post should be advertised in the United Kingdom.

(xix) *Scheme for research into the diseases of poultry at the Imperial Veterinary Research Institute, Izatnagar.*—A scheme for the study of contagious diseases of fowls was originally submitted by the Government of Bengal. The proposal was approved but it was decided that the work should be carried out at Izatnagar, in collaboration with the proposed Central Poultry Institute and that it should be under the administrative control of the Director of the Imperial Veterinary Research Institute. It is intended to send a qualified officer for two years' study abroad, in order that he may become acquainted with modern work on poultry diseases and the methods of their investigation and control. This officer is to be recruited shortly.

(xx) *Research into the Helminthiasis of cattle, sheep and goats, U. P.*—Work on this scheme commenced at the Lucknow University in February 1937. The enquiry is directed towards the collection of Indian helminths and the study of their life histories with a view to combating the intermediate hosts. It is hoped that as a result of this investigation it will be possible to suggest measures for the control of those helminth parasites which are responsible for heavy mortality in livestock in this country.

(xxi) *Appointment of a systematic Protozoologist at the Imperial Veterinary Research Institute, Mukteswar.*—Reference was made in the previous year's report to the inception of a scheme by the Imperial Council of Agricultural Research for the appointment of a systematic protozoologist to work out the bionomics of the various protozoa which are the cause of serious losses among valuable stock in this country. The scheme has just completed its first year and a report is due shortly.

12. *Technology of vegetable oils.—Oil Section of the Harcourt Butler Technological Institute, Cawnpore.*—The Imperial Council of Agricultural Research sanctioned a grant of Rs. 30,000 to meet expenditure on the Oil Section of the H. B. Technological Institute during the year 1936-37. This was the third year of the scheme. With this help, the Oil Section continued its activities in helping the oil industry by giving technical advice, undertaking technical researches and imparting specialised training in the technology of oils and allied products to students from all parts of India.

During the year under report, the Oil Section dealt with 50 enquiries regarding difficulties in processes and technical information connected with the development of the industry, *viz.*, oil milling, refining of oils, soap manufacture and manufacture of allied products. In addition to the above, technical help in the matter of drawing up schemes has been given to some twenty persons interested in starting new concerns or developing the existing ones connected with the various phases of the oil industry.

During the year under report, 162 samples were analysed. In addition to the above, the Oil Section, with the help of the special staff, analysed

726 samples for the Agricultural Marketing Adviser to the Government of India as a basis for the establishment of grade standards for oilseeds, oils and fats, *viz.*:—

(1) Samples of mustard, rape, *rai* and *taramira* seeds for refraction.	425
(2) Samples of mustard, rape, *rai* and *taramira* seeds for oil contents and moisture estimations.	132
(3) Samples of oil examined :— Groundnut oil 30, linseed oil 34, mustard oil 33, *til* oil 22, boiled linseed oil 36 and sun-flower oil one	156
(4) Ghee samples	13
Total	726

Analytical investigations were undertaken and expert advice rendered to the departments of Agriculture and Industries of the United Provinces, the Central Provinces, the Punjab, Bihar and to Udaipur and Gwalior States.

The following research experimental work was conducted at the Institute during 1936-37:—

1. Grade Standardisation of oilseeds and oils.
2. Study of the constitution of oil from *Mesua ferrea* (*nageshwar* oil).
3. Study of linseed oil from various types of linseeds produced in India.
4. Production of vegetable casein from castor cake for plastics.
5. Direct determination of solubility of soaps in water.
6. Rectification of orange oil from the North-West Frontier Province.

13. *Agricultural.—Rice Research.*—(i) *Reconstitution of the Standing Rice Committee.*—This Committee was set up in February 1936 for a period of two years in the first instance. The question of the reconstitution of the Committee was accordingly considered by the Governing Body in December 1937. It was decided to extend its life for a further period of one year with a slightly modified personnel. A list showing the composition of the new Committee is appended. (Appendix II.)

(ii) *Second Meeting, 1938.*—The Committee met at New Delhi on the 5th March 1938, a Research Sub-Committee meeting on the previous day. A statement showing the subjects that were considered by the Committee together with a brief summary of the recommendations made by it will be found in Appendix III.

(iii) *Progress reports on Rice Research Schemes, 1936-37.*—The following paragraphs furnish brief summaries of the progress of the research work on the various schemes during the year 1936-37.

(*a*) *Madras (Berhampur)*:—

This is the fifth year of the scheme.

Among the practical results of the five years research work are the following:—

Two strains which yield 15 to 25 per cent increase over the respective ryots' bulk have been evolved in five major varieties of the tract, and cultures have been isolated from another set of eight varieties, which after two years' yield trials promise to yield more than 15 per cent increase.

In agronomic trials sowing thin at the rate of 3 lb. per one cent. of nursery and planting not more than six inches apart in two seedlings per hole increased the yields over the common practice of sowing thick and planting in bunches by 10 per cent. Seed-beds raised early in the season showed better results and planting seedling aged more than 40 days reduced the yield progressively. A well cultivated and well managed broadcast crop of paddy yielded as much as a transplanted crop in the canal fed areas.

Manurial experiments indicated that (1) superphosphate, Ammophos and green leaf applied heavily to the nursery alone gave no response, whereas when applied to the transplant field there was increased yield, irrespective of manuring the nursery; it is therefore profitable to manure the transplant fields rather than manure the nurseries heavily.

(2) Superphosphate (at 25 lb. P_2O_5 per acre) without a basal dressing of green leaf, did not give any response but with 4,000 lb. of leaf it gave a net profit of Rs. 4-8-0 per acre.

(3) Ammonium sulphate to supply 25 lb. N per acre without leaf, though yielding a little increase over no manure was not economical at its present price but with 2,000 lb. of green leaf a net profit of Rs. 4 per acre was obtained.

(4) Application of lime (slaked) at even 1,000 lb. per acre over three years of the experiment was without effect on yield.

(5) Green leaf from outside or green manure crops raised '*in situ*' to give at least 4,000 lb. of green matter, were found to be very beneficial to the soils of Berhampore which were analysed and found to be deficient in organic matter.

(6) A good crop of indigo could be raised for green manuring by sowing it just after the harvest of paddy, either as a pure crop, or as a mixture with green gram (*Phaseolus mungo* var. *radiatus*).

(*b*) *Bengal (Chinsurah and Bankura)*.—Contrary to last season which was bad the season of 1936-37 was on the whole quite favourable for rice. At Chinsurah the rainfall was slightly above normal and the distribution was more or less regular. There was however a slight deficiency during the month of October at the critical stage of flowering, which affected the final yield of rice and in consequence the yield was not at its highest. It may be noted that there was an attack of rice case-worm (*Nymphula depunctalis*) during this season and the crop which was planted late suffered most. At Bankura the crop was a bumper one. In Suri, rainfall was deficient in the earlier part of the season which affected slightly the raising of seedlings and normal transplanting but from August onward the rainfall was very favourable and the September rain, was specially beneficial so that the paddy crop was more than normal everywhere.

Work was continued in the botanical study and isolation of pure lines. The "situation" experiment started in 1934-35 with the object of investigating the order of interaction between varieties and situations and for studying the possibility of combining more than one adjoining terraces in one experiment, and the extent of difference in varietal duration permissible in one single test gave very well marked and interesting results. The study of the life period in the *Aus* and *Aman* varieties of rice was started from 1st August 1935 and was continued for twelve months upto July 1936 Detailed notes regarding growth, tillering, flowering, ripening etc., were recorded but due to a large number of deaths they did not admit of a strict statistical analysis. The experiment will be continued in plots during the season 1937-38 and an attempt will be made to draw conclusions on the basis of two years' results. Brief reference was made in the last annual report to the correlation studies of the various characters of *Aman* and *Aus* paddies. The results on analysis of *Aman* strains show that the yield of grain for a given strain is significantly associated with weight of straw, number of tillers and total number of spikelets. The other characters do not seem to have any linear relation with yield. Varieties with broader flag leaves appear to be more high-yielding than those with thinner ones. The height and flowering period also are found to be associated with high-yielding characters. These conclusions do not wholly agree with last year's observations. It may be that the sustained drought led to extreme abnormal conditions of plant growth. Sufficient data for this correlation study have however been collected this year and are being analysed. The correlation study among the *Aus* strains had to be abandoned as the year was bad and the different strains could not be grown in sufficient numbers.

The complex cultural experiments have reached a definite stage and their discontinuance is under consideration.

An experiment was started this season to study the relative merits of mixed cropping *vs.* single cropping with transplanted *Aman* rice on medium low situation. There were three different treatments in the experiments. (1) Mixed cropping with Tilakkachary (long duration paddy) and P X S (8) (short duration paddy); (2) with Tilakkachary and Jhanji (short duration paddy); and (3) Tilakkachary alone. The mixtures were made in the ratio of 1 : 3. Results show that by far the highest yield is obtained with single cropping.

Several crosses have been made to evolve high yielding strains of rice that conform to trade requirements and also to study the inheritance of economic characters. The research staff has already selected a strain which is in its third generation. It is found that this strain is quite close to the American Blue Rose in size and also in texture. It will take sometime before it can be definitely said whether it can successfully compete with Blue Rose in the export markets. In regard to the work on Patnai rice, Gosaba *23* was being distributed in the north-east corner of the district where the quality of Patnai rice had deteriorated. In the south-east part of the district where the best Patnai rice was grown there was not yet a variety superior to the local. At the suggestion of the Director of Agriculture, Burma, it has been decided that new varieties intended for export should be sent to the Bengal Chamber of Commerce for opinion before they are distributed to the cultivator.

Other experiments include preliminary and semi-final yield tests and manurial experiments including the determination of the time of application of chemical manures.

(c) *United Provinces (Nagina).*—During the year ending March, 1937, which is the fifth year of the working of the Rice Research Station, Nagina, the research work progressed yet another step on lines already described in the previous reports. The number of cultures grown in the year under report was 1,226. Of these 204 cultures represented the F_7 generation of the Sathi crosses and 117 cultures represented the same generation of the Economic crosses.

Work on Sathi crosses continued. The hybrids which passed the F_7 stage during the year are still under examination, only two of them being considered homozygous enough to be put to yield tests. Only one of these appears suitable for multiplication, having shown in a yield trial a significant increase of 18 per cent in grain yield over the *Sathi* parent (T. 131) under transplanted condition. Yield trials under broadcast condition, however, gave a decrease of 21 per cent over the parent, but though large, the decrease was not found to be significant in the light of the standard error. This decrease was due mainly to an accidental defective germination of the hybrid seed. The agronomic experiments laid down in the year under report were planned after due consideration had been given to the results of the previous years. A three-fold complex cultural experiment has been designed with the factors (1) age of seedlings at transplanting, (2) time of planting, and (3) varieties, and seeks to test the influence-individually or in combination of the various factors. Another cultural experiment added deals with the problems of broadcast sowing, dibbling, drilling and transplanting. A new rotation experiment on slightly different lines has been devised. Preliminary varietal trials with some of the outstanding new varieties were laid down. Experiments on the vernalization of seed were not very promising. Although there appeared to be a slight superiority in tillering, the differences in this and other respects in the various treatments were neither consistent nor conclusive. An effective method of vernalizing paddy has yet to be discovered.

Cooking trials revealed the superiority of *sela* (partially roasted) rice over *kachcha* (raw) rice.

Cytological studies.—The cytological studies were reduced on account of a sudden change in staff. Only the cytology of the haploid plants was completed. Haploidy was confirmed cytologically, while microscopic and morphological observations on the haploid and another set of abnormal plants were completed. The F_2 generation of a cross between the haploid and T. 26 (parent) plant gave segregation into normals, haploids and plants of intermediate character.

A resumé of the practical results of the five years' research work at Nagina.—The work at Nagina during the past five years has thrown light on the inheritance of various characters, which makes for success in practical breeding. It has yielded information on the response of paddy to different manurial and cultural treatments. It has revealed the hulling and cooking efficiency of different types and the necessary appliances.

The practical results of the last five years may be stated briefly as follows:—

Information on the performance of the pure line types has led to the wide distribution of T. 1, T. 3, T. 12, T. 21, T. 23 and T. 100. With a better appreciation of the high yield and better quality of these types the mixed varieties of the cultivators are being replaced by these pure types. In the long run the spread of pure types is bound to improve the quality of rice in the market besides facilitating grading for marketing. Pure seed is being produced and supplied at Nagina.

As a result of a cross between T. 1 (early) and T. 100 (late) a heavy yielding early hybrid has been extracted. It has been named T. 136 and is now one of the earliest types under distribution.

The problem of saving the early rice crop from the rice fly, *gundhi*, has been successfully handled, and about 150 hybrid strains, immune to the fly, have been bred. They are superior to *Sathi* in yield and fineness of grain, and are earlier than the types under distribution. It had become almost axiomatic that good early rices must be a prey to *gundhi* in U. P. and that the only way of escape from this fly was the cultivation of the coarse poor-yielding, naturally immune *Sathi* rices. The hybrids combine in them the immunity of *Sathi* with the better qualities of the other early rices, and will therefore fill up a long felt want of the agriculturists of these provinces. Strains of promise from other crosses are under test and will soon be released for distribution.

(*d*) *Burma* (*Hmawbi*).—The main items of work carried out during the year were as follows:—

(1) Study of 229 hybrid cultures of crosses between local strains and local strains, and local strains and exotic varieties, mainly for breeding.

(2) Study of exotic varieties from America, Java, Formosa, Nyasaland, Philippine Islands and British Guiana.

(3) Genetical studies connected mainly with—

(*a*) Sterility and partial sterility.

(*b*) Inheritance of grain and endosperm characters.

(*c*) Size and shape of grain.

(*d*) Grain shedding.

(*e*) Life period, tillering, panicle length, height, etc.

(4) Investigations into the effects of soil and climatic condition on the quality of rice.

(5) Investigations into the effects of different dates of harvesting on the quality of rice.

(6) Experiment to determine the best size and shape of plot for experimentation with paddy.

(7) Eight different yield tests with 58 hybrid cultures on the Station and with 14 cultures at eleven centres in the Districts in collaboration with the Deputy Directors of Agriculture in Lower Burma.

(8) Preliminary multiplication of new strains for distribution in the Districts.

(*e*) *Bihar* (*Sabour*).—The present report deals with the fifth year of the working of the scheme, which was originally sanctioned for a period of 5 years only, but since then it has further been extended for another 3 years. It is therefore desirable to indicate briefly, at this stage, what important results have been achieved.

1. *Nearly 200 pure lines have been finally isolated from the more common varieties of South Bihar* and from amongst these about half a dozen high yielding selections have been finally established for different classes of land.

Most of these selections possess a high degree of adaptability—thereby making them suitable under diverse soil and climatic conditions that obtain in this Province.

2. There has also been accomplished the *isolation of the pure-lines of 'Dalua' (or summer) paddy of Orissa, which finally number* 35. Besides this, there have been *further evolved 20 types as new introductions*, possessing much better grain quality, *for being grown as 'Dalua'*. One of these new introductions (Type 5), which was previously called D. I. 59, combines such desirable characters as earliness and consequent less water requirement with better grain quality (white medium fine grains) and high yielding capacity.

3. *Isolation of nearly 120 pure-lines of 'Beali' and 'Laghu'* paddies of Orissa, both of which belong to the class of 'Aus' or autumn paddies. The final selection of high-yielding strains of this class of paddy has not yet been accomplished, but some of them, tried this year, have shown themselves to be quite promising and only need further trial for final selection of the most promising.

4. A complete knowledge of the time and sequence of blooming in paddy flowers and its variation from one class of paddy to another has been acquired.

5. Detailed studies of root system under diverse soil and climatic conditions were carried out and fairly interesting results were obtained.

6. A definite physical basis for expressing the quality of fineness or coarseness in rice grains has been found and named 'Grain Quality Index'.

7. Existence of a certain period of dormancy in most of the paddy varieties has been established and it has further been found that, *under ordinary condition of storage, they maintain full viability for about 8-9 months from the time of harvest.*

8. Success has also been obtained *in altering the flowering time of the so-called* "time fixed" paddy varieties (by 3 to 4 weeks) *by subjecting them to 'short' and 'long' day treatments.*

9. *The possibility of growing paddy in saline tracts by pre-treating the seeds with minute doses of common salt has more or less been established.*

Besides the above results, which show some of our outstanding achievements, a number of agricultural and manurial experiments have been conducted which have also yielded interesting results that are summarised below. The *experiment on age of seedling and time of transplantation* points to the superiority of earlier planting and of somewhat older seedlings (4—6 weeks). The *investigation on the most*

suitable leguminous catch crops has more or less established the fact that growing of different catch crops (gram, peas and *khesari*) have no deleterious effect on the growth of the subsequent paddy crop and as such it is of advantage to grow any of these crops in paddy fields. The *experiment on the practice of 'Nigar'* has practically established the fact that this practice has no advantage over the ordinary irrigation practice followed in these tracts.

In various *yield trials* with some of the outstanding selections of South Bihar paddies, the superiority of a number of our selections belonging to different classes of maturity has been statistically established. The selections that have yielded 20—50 per cent. higher than the standard varieties of the same class are given below:—

Early.—115, 164-17, 68C-18, 144-1.

Medium.—16, 150-1, 88, 98.

Late.—51, 76, 474, 498, 548, 743.

Very Late.—36, 111, 877.

Some of these selections have also been tried in other tracts of the province and in most cases they have established their superiority under those conditions as well.

The experiment on the *comparative effect of various nitrogenous and phosphatic manures* on paddy has definitely established the advisability of applying ammonium sulphate or ammonium phosphate to the transplanted crop, which gives an extra net profit of about 6-10 rupees per acre. *The experiment on the determination of the most suitable combination of N and P manures* has also yielded statistically significant results—pointing to the superiority of certain combinations which, however, need further confirmation. The experiment on the *comparative utility of supplying green manures to the paddy crop*, with or without phosphates, has shown statistically the superiority of green manure with the addition of phosphates over all other treatments. In another experiment on the most *appropriate time for the application of artificials*, their application 2 weeks after transplanting has given indications of being more advantageous than the present practice of applying them at the time of transplanting. This, however, needs further confirmation.

(*f*) *Central Provinces* (*Raichur*).—Breeding work was continued particularly with a view to evolve heavy yielding strains which can be easily distinguished from wild rice. The F_3 generation of the cross E. B. 17 × Nagkesar was grown and some promising hybrids possessing the desired combination of characters have been secured which have given higher yield than E. B. 17.

In yield trials carried on for four successive years, the hybrid strains Bhondu × Parewa Nos. 22 and 116 have consistently proved superior to the prolific strain Bhondu 10. Cross No. 19 (Budhiabako × Parewa) maintained its reputation as a high yielding fine rice which can be distinguished from wild rice. These hybrids were distributed for the first time during the year and have met with considerable success. Fifty-two replicated yield tests were laid out at Raipur, Waraseoni and Jubbulpore for the isolation of high yielding varieties suitable for the three main rice growing tracts of the Province and fifty-nine varieties

have been finally selected for varietal tests. Selection work in fine and scented rices has yielded some strains of uniform quality and improved cropping power.

A botanical survey of paddy varieties grown in the Central Provinces is nearly complete and 710 pure lines have been isolated which have been classified into 385 different types. Experiments on the loss of vitality in stored rice grains indicated that the seed retains its full power of germination for about twenty months after harvest (*i.e.*, up to the time of the second sowing season) and then begins to lose its vitality. In hulling tests with improved varieties, the early ripening strain E. B. 17 gave the highest outturn of whole rice. Some fine rices also gave good milling results.

Irrigation experiments carried out in dorsa soil with late ripening variety, proved that the standing water treatment gives significantly higher yield than no irrigation. The manurial experiments have shown that the application of phosphoric acid at 20 lbs. per acre in the form of superphosphate is most economical and gives the largest net profit of Rs. 4 per acre. 20 lbs. P_2O_5 with 20 lbs. nitrogen in the form of Ammonium sulphate also gives the same net profit.

The results of the mechanical analysis of rice soils show that in general the percentage of clay increases with depth and that there is no particular relationship between the clay content and the percentage of loss on ignition. Results of the chemical analysis show that the lime content of the heavier soils is higher than that of the lighter ones. There is very little reserve of calcium present in these soils as most of the calcium present is in an exchangeable form. Percentages of total and available phosphoric acid do not seem to follow any particular course of variation either according to depth or texture of different types of rice soils. The results of the leaching experiments indicate that when the untreated soil is leached for a period varying from 24 to 72 hours, the chief constituents lost are nitrogen in the form of ammonia, nitrite and nitrate, and calcium. Nitrogen as nitrites and nitrates is lost within the first 24 hours. When the soil is treated with ammonium sulphate a greater quantity of calcium is leached out.

Pot-culture experiments show that the locally prepared bone manure is nearly as effective as superphosphate.

(*g*) *Assam* (*Habiganj*).—The period under review is the third year of its existence and embraces the results of the second season's work on both Boro and Deep Water Aman. In Aman under favourable growing conditions one of the selections in an yield trial yielded 4036 lbs. per acre. In Boro some promising selections have been put out in yield trials and a few high yielding strains are expected to result. The Departmental introduction of power pumps resulted in the issue of all the Boro paddy grown in the Farm as seeds not only in the Surma Valley where most of the Boro paddy of the province is confined but also in the Assam Valley where it has been newly introduced.

At the close of the financial year about 25 acres of land have been newly acquired for the Farm. This will make additional Boro and Aman land available for experimental work for which the need has been very great.

In Aman, the work on growth studies, submersion and other factors is being carried out on lines similar to those mentioned in the last report. Observations on growth studies were carried out in the controlled tank as well as in the field. A large amount of data has been collected on the relative merits of different pure lines in withstanding water rise at critical periods in the life of the plant. This information will be of use in making selections for flood resistance. Preliminary observations indicate that flood resistance and high yield are independently inherited and are in many cases inversely correlated so that flood resistance is not necessarily accompanied by high yield and that hybridization might have to be resorted to in combining both the characters.

The classification work on Aman is progressing satisfactorily. The isolation and classification work is making good progress and should be complete in a couple of seasons by which time the rejection of duplicates will be nearly complete.

Hybridization work has begun. It has been carried out with the object of obtaining fine grained Boro varieties by combining the high yield of Boro with the fine grained character of some of the Aus varieties. One of the crosses is in F_2 generation while a few others are in the F_1 generation. It is proposed to speed up work by growing the F_1 generation during the Aus season.

Preliminary studies have been carried out in drought resistance by subjecting freshly germinated seedlings of selected pure lines to different periods of sunning and noting the ability of the seedlings to recover. Preliminary data tend to show that this might lead to a method of distinguishing drought resisting varieties at the young stages of the plants.

Cultural experiments in Aman are being carried out to determine the best time of broadcasting studied in relation to the seasonal conditions prevailing at the time of sowing and the incidence of June flood. This experiment is now being carried out for the second year. Carried over a number of seasons it is expected to throw some light on the relation between factors such as the field and weather conditions at the time of sowing and also give an idea of what might be the minimum and yet the optimum time between sowing and the arrival of the flood. In Boro for the first couple of seasons field experiments were only confined to cultural experiments. With the progress of our work on the isolation of pure lines, for the first time this year 84 selections have been put down in preliminary yield trials. Some of these strains are expected to be high yielding. Cultural experiments were carried out on almost the same lines as in the previous year in order to confirm the first years' work. A new experiment was laid out to test the possibilities of broadcasting Boro in high lying areas. It was thought that this might have some future in areas where Boro crops are being grown in Aman land by means of power pump irrigation. In this experiment broadcasting was compared with transplanting and though the yield for broadcasting was slightly lower, the differences between the two treatments were not significant. This year two of the primary effects, age and number of seedlings per bunch, were found significant. There was a progressive deterioration of yield with the increase in age of seedlings from 4 weeks to 7 weeks the differences in yields between 4 and 7 weeks being over 600 lbs. per acre though there was no significant difference between seedlings of 4 and 5 weeks.

(*h*) *Orissa.*—The new scheme commenced work only in July 1937 and the first progress report will become due only next year.

(iv) *'Gangai' Disease of Paddy.*—The 'Gangai' disease of paddy is caused by an insect known to science as *Pachydiplosis oryzae*, belonging to family Cecidomyidae of the order Diptera. It is known to exist in the Eastern districts of the Central Provinces for the last twenty years and is gradually spreading westwards.

A scheme of research work was formulated and submitted by the Director of Agriculture, Central Provinces, to the Imperial Council of Agricultural Research in December 1934, who sanctioned it on 20th April 1936 for two years.

The first Annual Report of the year 1936-37 was considered by the Rice Committee at its meeting held in March 1938. The chief lines are the effect of light traps, dew and alternate hosts. The work was considered useful by the Committee and the report was approved. It was suggested that the next meeting of the Entomological Committee should consider this work also.

(v) *Botanical Sub-station, Karnal.*—The Botanical Sub-station Scheme was originally sanctioned for a five year period and the sub-station was started at Karnal in September 1930. The chief object of this Scheme was to provide a centre where crops bred in the Botanical Section at Pusa could be tested under quite a different set of soil and climatic conditions. The Karnal Sub-station thus afforded an opportunity of studying the comparative reactions of the same varieties of crops to irrigated and late-maturing conditions as against the non-irrigated and early maturing conditions obtaining at Pusa. The general conditions of soil and climate at Karnal constitute a typical example of one of the most important agricultural tracts in India and the establishment of a sub-station there thus furnished facilities for making trials of Pusa-bred strains of crops and determining their usefulness for such tracts.

The scheme was renewed from October 1935 for a further period of 5 years but the transfer of the Imperial Agricultural Research Institute to Delhi necessitated the transfer of the activities of the sub-station to Pusa in order to maintain the continuity of research work on crops under the two sets of soil and climatic conditions. The transfer of the sub-station was effected on August 1, 1936 and marks a new stage in its history.

In addition to the type of work which was being done at Karnal, the sub-station has undertaken to continue the two series of permanent manurial experiments which the Imperial Agriculturist had conducted over a large number of years at Pusa. The sub-station has also taken over the work on flue-curing of tobacco and the short-course of training on this subject for officers of Provincial Departments of Agriculture, and for private students, which was previously conducted at Pusa by the Botanical Section. Some lines of botanical work, *e.g.*, breeding work with pigeon-pea and tobacco investigations for which the climate of Pusa is better suited than that of Delhi will also be continued. The sub-station is also affording facilities to the Entomological and Mycological Sections for the study of pests and diseases under conditions differing from those prevailing at Delhi.

The yield trials of Pusa 52, Pusa 120, Cawnpore 13 and Pusa 111 outyielded the other varieties, in the order given, although these varieties themselves did not differ significantly from each other in yield.

The study of hybrids and strains of barley selected by the Botanical Section was undertaken with a view to discovering types suitable for cultivation in North Eastern India. Some of the former are promising in that they appear to combine high yielding capacity with well-filled grain of attractive colour, and it is hoped to conduct preliminary yield trials of them next year.

A preliminary manurial trial was carried out with barley to test the relative efficiency of fermented and non-fermented mustard cake. The differences in the yields of straw and grain obtained from the treatments were not statistically significant but there were indications that the application of fermented cake had a beneficial effect on the outturn of both grain and straw. It is proposed to pursue this investigation next year when a proper experiment will be laid down.

The sub-station is also paying attention to the question of the improvement of the fodder supply. Oats are one of the most important fodder crops and can be grown successfully over a fairly wide range of soils and climates, provided suitable varieties are selected for each tract. A trial was laid out during the year under report to determine the differences in yields of green fodder, grain and straw between 10 strains of oats.

(vi) *Potato Breeding Research in Northern India.*—During the first year 1935-36, an experiment to determine the most suitable site in the hills for a potato breeding station was carried out with the co-operation of the Directors of Agriculture of several Provinces and, as a result, Simla was selected as the most suitable place for the sub-station. As however the site selected at Simla for the purpose could not be acquired during the year under report, a portion of Villa Harding (near the Rust Research Laboratory) and a block of land of about four acres were leased for a year and a temporary station established there. Space for storage was provided at the Rust Research Laboratory. Owing to the lack of irrigation and facilities for growing plants under controlled illumination, etc., at the temporary station the work was perforce restricted to some extent and could not be carried on as large a scale as would have been desirable.

Thirty-one samples of potatoes were received this year, bringing the total number in the collection to 294. These comprised both European and local (*desi*) varieties.

Further material was received from Cambridge, Leningrad and America. A new species, *S. Phureja* Juz. et. Buk. was added to the collection. Tubers of S. *Rybinii* Juz. et. Buk. were also received, but unfortunately these rotted away before they could be sown. The study of the new material as well as that received in 1934 and 1935 was in progress. The study of the seedlings raised from true seeds of the Pusa White and Coonoor White varieties was also continued. No tests for resistance to Late Blight under controlled conditions could be undertaken, as the material was rather limited. The field resistance of the different species and hybrids to the natural epidemic of Late Blight was however studied and some useful information on the subject is now available.

Late Blight caused by *Phytophthora infestans* (Mont.) de Bary. appeared in epidemic form at Simla in July 1936 and afforded an opportunity for detailed observations on the relative resistance of the varieties of wild and cultivated potato species growing at the sub-station. The disease was first observed in the last week of July, and, favoured by the

excessively humid atmospheric conditions, spread very rapidly. Frequent sprayings with Bordeaux mixture enabled the most valuable material to be saved.

It is hoped to undertake controlled tests for resistance to Late Blight next year, with the co-operation of the Mycological Section of the Imperial Agricultural Research Institute.

A large number of crosses was attempted. In planning the crossing programme the experience regarding the relative resistance of varieties obtained as a result of the Late Blight epidemic was utilised, and crosses were attempted between the best Indian varieties and the most promising foreign ones.

The study of flowering, pollen, fertility and berry production which was commenced last year was continued and extended to include the South American species which were likely to be used as parents for crossing.

Germination tests of pollen *in vitro* could not be carried out owing to lack of the necessary facilities at the temporary station.

(vii) *Potato Research in Madras.*—There were 277 hybrid varieties under multiplication. Out of these, 61 were selected for preliminary yield trial and 31 for further multiplication. Detailed botanical study of these varieties was made and recorded. At present there are 75 varieties under Row Yield Trial and 104 under multiplication and 83 growing in pots. These comprise 17 intervarietal crosses and 2 interspecies crosses.

To introduce new blood and widen the basis of working materials, 13 exotic species were asked for. Six have since been supplied and are under multiplication. They are (a) *neoantipoviczii*, (b) Russian Type No. 8178, (c) *andigenum*, f. *ecompis*, (d) Early Rose × *Andigenum tocanum*, (e) *Demissum adpress* Buk. × (f) *acaule*.

Classification of potato varieties according to their flower production, flowering season, pollen bearing capacity and maturation period was carried out.

The technique of inducing flower bud to mature for crossing purposes in non-flowering varieties was pursued.

Much attention was paid in isolating and rogueing of virus suspected plants from all the varieties. This study is being pursued with the co-operation of Government Mycologist, Coimbatore.

The report was considered by the Botanical Sub-Committee in November 1937, who recommended that before the scheme was renewed the Imperial Economic Botanist should visit the station in order to see what results had been achieved and how it affected the programme of work of the Central Potato Breeding Station and how far the schemes could be made complementary. The question of the extension of the scheme was considered in March 1938 and it was recommended that the scheme should be extended for a period of six months.

(viii) *Investigations on cereal rusts by Dr. K. C. Mehta.*—(i) *Progress report for 1936-37.*—This is the second report under the further extended scheme (extended in April 1935). During this year, (a) study of the physiologic races of all the three rusts of wheat and (b) intensive study of the suspected role of the more common indigenous species of *Berberis* and *Thalictrum* was carried on.

As in previous years, cultures of all the three rusts of wheat, two of barley and the black rust of oats were successfully maintained throughout the period. Rusts of wheat were found throughout the year in a viable condition in miniature plots attached to the laboratory. Uredospores from these plots were tested for germination twice every month and, as before, yellow rust showed poorest viability during summer and black rust during winter. As before brown rust showed better germination during winter than black. Teleutospores of black and brown rusts of wheat obtained from the miniature plots were used for inoculations on species of *Berberis* and *Thalictrum* respectively.

As before, all the three rusts were found to oversummer on volunteer wheat at several places in the Simla hills.

In Kashmir, black and brown rusts were found on self-sown plants of wheat and black rust on barley in the last week of July and the beginning of August 1936. Yellow rust was found on the standing crop at altitudes of 6,000 ft. and above.

Black rust was found on stubble in the Ghat area in the Nasik district in April 1937 and also on self-sown wheat near Mahableshwar during May last.

In the Nilgiris and Palni hills all the three rusts were found on the standing crops during September-October 1936.

Simultaneous observations were again made in the North and Peninsular India regarding the incidence of rusts in relation to their first outbreaks.

During the year under report, slides were exposed in aeroscopes at 54 stations and spores of each rust were caught, as prviously, long before its appearance on the crop at most of the stations.

Wind curves with reference to all the 3 rusts for the remaining 12 stations for the year 1935-36 as well as for Mandya for brown and for Gorakhpur and Lyallpur for brown and yellow rusts were prepared and studied. In all, 1,799 curves have been studied during the year under report.

Wind curves for 20 stations for 1936-37 as against 18 for 1935-36, are under preparation.

A survey of rusts in co-operation with the Professor of Botany, Lyallpur and the Mycologists at Poona and Coimbatore was started during 1935-36 and the information obtained during the year under report is summarised below:

(1) In the Punjab all the three rusts were found to oversummer at several places in the Siwalik hills. As before, brown and black rusts appeared in the plains, at any rate at the places visited by the survey assistant, during April-May. Yellow rust was observed in traces at Lyallpur in the third week of December 1936 and at Montgomery in the 4th week of January 1937.

(2) Black rust in the unredo-stage was found on stubble in the second week of April in the hilly tracts of Nasik district and on volunteer wheat in the second week of May 1937 in the neighbourhood of Mahableshwar, (4,383 ft. above sea level). Black rust has been found to oversummer in the Western Ghats on previous occasions as well.

With regard to the incidence of rusts on crops in the plains it may be stated that black rust appeared during December 1936—January 1937 at most of the places visited. Absence of brown rust was reported from Dharwar, Arbhavi (near Belgaum), Broach and Jagudan, but it appeared in the last week of January 1937 at Baroda. Yellow rust was not reported from any station in the plains of Peninsular India.

(3) In the Nilgiris and Palni hills the late-sown first crop, as well as the second crop, were found heavily infected (1—100 per cent) with all the three rusts in the last week of September and early in October 1936. Infection of the barley crop with yellow rust was also well advanced.

In the plains of the Madras Presidency, brown rust appeared at Coimbatore by the middle of November 1936 and the crop infection with this rust rose up to as high as 100 per cent in the third week of January 1937.

(ii) *Extension of the scheme for further two years.*—In August 1937 the Government of the United Provinces submitted a proposal for the continuance of these investigations. This was considered by the Wheat Committee who recommended an extension for a period of two years at a cost of about Rs. 64,000, inclusive of a sum of Rs. 6,560 for a co-ordinated scheme of survey and study of rust epidemiology in the provinces and some Indian States. It was also agreed that Dr. Mehta should definitely arrange for the following publications during the first year of the renewal of the scheme, *viz.*, parts I, II and III of a publication which might be called "Studies in Cereal Rusts in India". Part I dealing with physiologic races, Part II with Berberis and Thalictrum and Part III with the data regarding oversummering. The publication of all the remaining data will be definitely complete in the second year. It was also agreed that during these two years certain investigations should be decentralized in consultation with provincial governments and constituent states. So far as the analysis of data was concerned, Professor Mahalanobis had agreed to assist in the work. These recommendations have since been accepted by the Advisory Board and Governing Body.

(ix) *The Breeding of Rust Resistant Wheat.*—As already stated in the previous report, the main object of the scheme is the evolution of wheat varieties combining rust resistance with other economically desirable qualities. The strains of wheat bred under this scheme are expected to be suitable for cultivation throughout the North-Indian plain and those portions of Peninsular India where varieties such as Pusa 4 are known to thrive. For tracts where special conditions obtain however localized wheat breeding may be also necessary. Work was continued along the lines laid down last year and the F_2 generations of a number of crosses were grown during the year under report.

Investigations.—The F_2 populations of eight crosses selected for rust work were tested. The seeds were sown in pots, and after germination, the seedlings were inoculated in the greenhouse, with a mixture of the physiologic races of one of the three rusts. After they had been thus tested the seedlings were planted out in the field.

Observations on morphological characters have been taken on these crosses and material has also been fixed for anatomical study. It is hoped in this way to correlate rust resistance with some easily determinable morphological or anatomical character and thereby expedite and simplify breeding for rust resistance.

The F_1 populations of a number of crosses, especially between Khapli and vulgare varieties, were studied. The seeds from such crosses often did not germinate; where germination took place the plants almost invariably died in the seedling stage.

Crosses between *T. Timopheevi* and vulgare varieties yielded seeds which failed to germinate. Crosses between *T. Vavilovianum* and *T. vulgare*, *T. dicoccum* (Khapli) and *T. durum*, and *T. dicoccum* (Khapli) and *T. persicum*, on the other hand, gave very vigorous hybrids.

A number of dwarf plants which either failed to head out or produced small sterile ears were noted in some crosses. Some stripped and virescent plants were also observed.

At the suggestion of the Standing Wheat Committee, the Sind wheat, C. P. H. 47, was included in the crossing scheme. Certain other new crosses were also made in order to utilize Rai Bahadur K. C. Mehta's results on the adult (generalized) resistance of certain varieties which were tested at Agra during the year under report.

A number of F_2 plants which had proved highly resistant to black, brown or yellow rust were inter-crossed with each other.

Attempts to backcross the semi-sterile Khapli hybrids to the vulgare parent were unsuccessful.

The study of the collection of 40 hill varieties, which was commenced last year, was continued. The best of these will be crossed with other resistant varieties with the object of producing rust-resistant strains suitable for cultivation in the hills.

The study of exotic varieties received from Great Britain, Australia, America, Germany, Russia, Afghanistan, etc., was also continued with the object of discovering strains suitable for breeding work.

14. *Horticultural Research.—A. Meeting of the Horticultural Research Workers Conference, September 1937.*—This meeting was held at Simla on the 13th September 1937. In addition to considering the progress reports of research schemes and the technical programmes of work the Conference also considered a memorandum regarding the need for uniformity in the maintenance of cultural records and performance records of fruit trees in different stations of India; the questions of layout of horticultural experiments and the better co-ordination of horticultural experimental work now in progress. These subjects were remitted to a small Committee of five, consisting of Dr. Cheema, Sardar Saheb Lal Singh, Mr. K. C. Naik, Professor P. C. Mahalanobis and the Statistician to the Council. This Sub-Committee presented an interim report to the Advisory Board of the Council in March 1938.

The Fruits Sub-Committee considered this report and remarked that one intergrated *system* of keeping records was necessary but that it was not necessary for records to be kept entirely on one *form*, nor exactly in the same way for every fruit crop. It recommended that Dr. Cheema's Sub-Committee should meet again in advance of the hot weather meeting of the Advisory Board for drafting a final report in which positive suggestions should be made for the technique of recording:—

(1) tree vigour,

(2) yields,

(3) other data,

in fruit experiments, with model forms.

The Fruits Committee considered that layout in fruit experiments should be according to Fisher's methods and that factorial designs, complex experiments and "confounding" were peculiarly suitable to horticultural problems. It was important, however, first to determine the variability of the fruit trees under experiment. In the case of old trees, this meant a knowledge of their history and a study of their variability for a year or two. Details of technique must be worked out for Indian conditions and in the final report by Dr. Cheema's Sub-Committee the reasons for recommending a particular number of trees for unit plots should be given. The Sub-Committee will meet in conjunction with the hot weather meeting of the Advisory Board.

B. Horticultural research schemes.—(i) *Madras.*—This is the second year of the scheme. Citrus and mangoes were important fruits on which work was carried out.

PART I.—CITRUS.

The American method of bud insertion with a slice of wood attached to the bud-shield has produced a larger number of chinee orange plants on Guntur sour orange rootstocks than the common Indian method of inserting bud-shield after removal of the wood. Lopping of rootstocks of Guntur sour orange at the time of bud insertion has stimulated 'bud-break', but it has been shown that the budded chinee orange plants will be available for planting in their permanent places within a shorter period of time if the lopping operation is delayed for about a month after bud insertion. In the collection of seedlings of different varieties of citrus raised for the purpose of rootstock trials, it was found that large differences exist between varieties in regard to the percentage of apogamic embryos and of germination, vigour, and extent of variability in the nursery stage, as well as in the successful 'take' of orange buds. The possibility of reducing variability in citrus seedlings by repeated selection has been indicated by the data on co-efficient of variability worked out on the basis of growth measurements prior and subsequent to a primary selection. Certain specific varietal characters have been observed by a study of root systems of eight different rootstock varieties. The remarkable depth to which roots of certain varieties penetrate at a very early stage and the enormous extent of pruning given to the roots at the time of transplantation are some of the interesting points revealed from the root studies. A scheme for work on 'Nomenclature and Classification of Fruits' has been sanctioned by the Local Government and a fairly exhaustive collection of citrus material, which will form the basis of future work, has been made.

A collection consisting of 57 citrus varieties of commercial importance has been made solely by propagation at the station nurseries with the help of budwood obtained from various sources. 27 individual chinee trees of outstanding merit have been propagated on four different root stocks. Some interesting indications of varietal susceptibility to certain pests and diseases are indicated by the observations made in citrus nurseries.

PART II.—MANGO.

Results of a large-scale trial on the effect of grading of mango fruits and stones on the germination percentage and vigour of seedlings denote that the practice of grading for size of fruit or stone is not likely to be an

useful method in mango nursery practice. Inarching with very young rootstocks of three to four and half months of age has been shown to be feasible. Exposure of roots of mango seedlings at the time of transplantation in certain periods has proved to be not very detrimental to the life of plants, as is popularly believed. Planting of mango grafts immediately after separation from the scion parent has been shown to be possible. An earlier manifestation of growth was found to occur in such plants than on those planted after the lapse of some time during which the latter batches of grafts were kept under shade. Beginning in the collection and multiplication of off-season bearing varieties of mangoes and of some other fruits was made. A collection of 70 reputed commercial mango varieties has beeen made and representatives of 63 varieties have been planted out.

(ii) *The cold storage of mangoes, other fruits and vegetables—Investigations at Poona.*—This scheme has now been extended for a further period of three years from February 1937. Cold storage trials of important vegetables have now been included in the programme of research.

The following are the main results of the investigations conducted during the 1936 season:—

1. Fully ripe Nagpur oranges, even if not completely yellow, can be kept in good condition for 3 months at 40° F. without any appreciable wastage.

2. Ripe Malta oranges can be kept at 40° F. in good condition without any wastage for 4 months.

3. Wrapping Alphonso fruit with tissue paper spoils ripening power after cold storage.

4. Rice-straw and wood-wool used as packing materials do not affect the Alphonso fruit while in cold storage but spoil the subsequent ripening to a certain extent.

5. A well ventilated crate of the size of 24″ × 12″ × 12″ capable of holding about 100 Alphonso fruits has been found to be a suitable kind of package for cold storage. Close packing with rice-straw, wood-wool, etc., and wrapping of individual fruits should be avoided, using only a light wadding of the packing material to support the fruit and to minimise bruising.

6. The fruit of B stage of maturity of the Pyree variety can be kept in good condition for 7 weeks at 45° F.

7. Seed-potatoes (Italian) can be kept in good condition without sprouting at 35° F. for 12 months without any appreciable loss in the germinating power.

(iii) *Horticultural Research Station, Krishnagar, Bengal.*—This is the third year of the research station. Varietal trials were conducted on mangoes, litchis, citrus fruits, guavas, papayas, pine apples, bananas and tomatoes. In addition, manurial, liming and cultural experiments were in progress. The weather conditions were not very favourable for the most of the fruit crops, especially the papayas and to some extent the pine-apples.

(iv) *United Provinces.*—Hill Fruit Research Scheme is being worked in four sections. (a) *Horticultural.*—An attempt was made during the year under review to follow the programme laid out in the previous

general meeting and the work was carried through according to that as far as possible, but due to certain unavoidable reasons, some items had to be left out altogether. The weather during the year being very abnormal, the plants propagated for our various experiments did not succeed to the extent hoped for as a result of which varietal trial and rejuvenation experiment had to be abandoned. To ensure the supply of the material for the next year, however, the plants have been propagated well in advance and in greater quantity and it is hoped to plant them out in the cold weather of 1937-38. The study of the differentiation of flower buds in apples also presented difficulties, which were not foreseen. The buds were fixed as usual, at fortnightly intervals and made ready for section cutting but when they were actually put on the microtome the material began to fall to pieces and no sections could be obtained. This failure was found to be due to a layer of air caught in between the scales which were very hairy in this case. There was no other remedy but to take them back again to water, remove the scales to the growing point of the bud and bring them up in the usual way with evacuation at each stage. This has been done and the new blocks are ready. When time allows sections will be cut and observations on the differentiation made.

The other items of the programme have been duly carried out and in addition certain other experiments suggested by the Director of Agriculture from time to time have also been incorporated. The experiment on *thinning of fruits* to ascertain the relative efficacy of different degrees of thinning and the *manurial experiment* on peaches are two of them.

The seedlings raised from the seeds imported from the Lenin Academy of Sciences have been transplanted in the nursery. Observations on their behaviour will be kept up.

(b) *Soil Chemistry.*—In view of its importance to other workers in the Station, it was decided in the Annual Meeting held in May last year that the work in this Section should at present be confined to the survey of the Chaubattia orchard soils only. For the sake of preparing a visual coloured soil profile map of the orchard it was decided that ditches for soil profile examination should be dug 200 feet apart at the inter-section of vertical and horizontal cross lattices on the orchard map. These could later on be supplemented by the examination of ditches at 100 feet apart.

As discussed in the reports of the previous years, the soils were collected from each horizon in the soil profile and classed into visual groups.

As some of the groups contained more soils than the others, it was considered necessary to examine more than one soil from a group containing a large number of soils. A scheme was drawn up for the total number of soils to be analysed from each group according to the number falling in it. The scheme of analysis adopted is given in detail in the annual report.

Apart from the preparation of coloured soil profile map and the analysis of soils, the work on the growth of Rosellinia (collar rot fungus) in media with different pH values was repeated taking a closer range of pH. This work was done in collaboration with the Research Assistant Mycologist on the suggestion of Sir Bryce Burt, the Vice-Chairman to the Council.

(c) *Entomological.*—The work during the year was carried out according to the programme laid down in the beginning of the year. Certain items,

however, had to be postponed due to the unusual weather from April to June which was responsible for lengthening the pupa stage of the apple-root borer and thus hindering the emergence of healthy beetles which were required for some experiments. The Woolly Aphis received much more attention than last year and certain experiments not actually included in the programme were also carried out on this pest. Trials were conducted for the control of Woolly Aphis on apple trees and on roots and shoots of dormant stocks, control of defoliating beetles and scale insects. The relative susceptibility of Malling types and some other stocks to Woolly Aphis was studied and on the basis of results obtained another experiment has been arranged to note the behaviour of this pest towards the resistants stocks in different types of soils. This year several new pests appeared in the rainy season. All such pests were brought to laboratory and reared. A record of the incidence of their attack is also being kept. Observations on the life-histories, distribution, economic status, and control measures of apple-root borer, Woolly Aphis, tent-caterpillar, shoot and stem borers, scale insects, and defoliating beetles and on the life-histories and distribution of Apple Aphis, leaf-curl aphis, and defoliating caterpillars have been continued.

(d) *Mycological.*—The survey and investigation of deciduous fruits was continued. In addition to the diseases already recorded in the previous annual reports one disease of apple, two of pear, one of peach, three of apricot and one of chestnut were recorded. A twig blight of apple was found doing considerable damage in the months of August and September. An attempt to identify the causal organism and to grow it in culture were being made. A species of *Phytophthora* was found affecting ripe fruits of apricot and pear. The causal organism was isolated and pathogenecity of one (*i.e.*, from pear) was carried out and established. The chestnut blight caused by *Endothia parasitica* was found to do considerable damage to stems of chestnuts. Among the experiments started in the year mention may be made of the following:—

(i) Replicated experiments in pots to find resistance of the stocks to collor-rot or root-rot of the apple. (ii) Effect of coal tar on the bark of apple. (iii) Small scale experiment on the control of Powdery mildew of apple by means of (1) Fungus Sulphur, and (2) Avons Colloidal Sulphur in Blocks E and N. In Block E the trees were of variety Esopus Spitzenburg of the same size and age; and in Block N all the experimental trees belonged to the variety Claygate Pearmain of the same age and size.

(v) *Fruits and vegetables preservation scheme, Punjab.*—During the year the scheme was extended for a further period of two years from November 8th, 1936. Experiments in regard to the preparation and preservation of citrus fruit squashes reported previously were continued

It was stated in the First Progress Report that the squash prepared from orange juice including oil from the whole peel had a bitter taste, which increased during storage. Further experiments were conducted by adding varying amounts of peel emulsion to the squash.

Methods of preparations and standardization of orange and lemon squash have been given; their recipes and cost of production have been worked out.

B. *Vitamin C Content of Citrus Fruit Squashes.*—Investigation on the preservation of fruit juices would not be complete without studying the effect of different methods of preservation on the vitamin content of the

bottled product. Citrus fruit juices being rich in vitamin C—the anti-scorbutic vitamin—its estimation in citrus juices has drawn the attention of quite a number of workers during recent years. Biological as well as chemical methods of its estimation have been tried and compared, and both these methods have been found to give similar results.

It is found that common *Malta* orange has the highest vitamin C content and that in the presence of peel emulsion the antiscorbutic potency of the juice is considerably reduced (due probably to the dilution of juice with peel emulsion). *Sangtaras* common and *Nagpuri* give a fairly low figure when compared with the common *Malta* orange. Moreover, there is a good deal of variation in the results given by different samples of orange juice. These are only preliminary observations; an attempt, however, will be made during the next season to contribute more detailed data in this respect.

In the samples of squash (orange and lemons) preserved with sulphur dioxide, it was found that the presence of sulphur dioxide seriously interfered with the titration values for the indicator. Experiments were, therefore, undertaken with the natural juice containing sulphur dioxide to find out the best method for driving out sulphur dioxide.

It has been shown that removal of sulphur dioxide under vacuum at a temperature of 100° to 110° F. in a current of air or carbon dioxide restores the titration value of the juice (containing sulphur dioxide) to the original value of the natural orange juice.

Estimation of vitamin C in 27 collective lots of orange and lemon squash has been done twice within 1½ months of the preparation of the squash, and there is an indication that there is a comparatively less loss of antiscorbutic potency in the squash preserved with potassium metabi-sulphite. These samples are under further examination and definite results will be reported when the investigation is completed. Samples of the products standardized so far, *viz.*, Tomato Ketchup, Lime Juice Cordial, Lemon Squash, Orange Squash, Canned Pears, Pear Jam, Jaman Juice and Syrup, and Mango Chutney, were sent out for opinion. The quality of these products has been very favourably reported upon. Samples of Tomato Ketchup, Canned Pears and Pear Jam have been declared fit for distribution to troops in India by the Officer-in-charge, Military Food Laboratory, Kasauli.

At the suggestion of Sir John Russell on the occasion of his inspection of this scheme, the Director of Agriculture asked two wholesale firms in the United Kingdom to test the quality of the products prepared.

Summary.—One firm replied very briefly that the products were not up to the standard of the goods which they stocked for sale. The other examined the products very thoroughly. Their general conclusion is as follows:—

The Tomato Ketchup is of satisfactory quality and compares favourably with most other ketchups on the market in England, except one or two of very special quality.

The aluminium screw cap is criticised as likely to blacken in use.

The Tomato Juice is of good quality except that the colour, being too brown, is likely to reduce its appeal to the public.

The Canned Pears are of satisfactory quality similar to those on sale in England.

The Canned Pear Jam was normal for this product for which the demand in England is extremely small.

The Lemon Squash would be more suitably described as Lemonade Syrup as it lacks fruit cells. It has an excellent flavour and appearance but is slightly weak in flavour. The addition of a little acid would probably improve the flavour of the product.

The Lime Juice Cordial, labelled Lemon Cordial, is too weak in flavour and colour, but otherwise satisfactory.

(vi) *Research on citrus stocks and grape vines in the Punjab.*—The scheme was started on the 11th November 1936.

In order to make a thorough enquiry into the varieties of different species of citrus, an effort has been made to obtain as many of them as possible from various citrus growing parts of India and Ceylon. In all forty strains from seeds have been raised successfully, out of which twenty-six could also be propagated by vegetative means. A study of the root system of some stock varieties raised both from seeds and cuttings was made at the time of budding. The effect on the cropping and quality of these sangtra plants, as influenced by environmental conditions, is also under investigation. Certain points of practical importance regarding different rootstocks, that go to make them commercially important, will also be studied incident to the preparation of material. This study would embrace points such as—

(*a*) Average number of seeds per fruit, percentage germination of seeds, disease resistance of young seedlings, time required for enabling them to become fit for budding, percentage of "take of buds", etc.

(*b*) Extent of apogamy in different rootstock varieties.

(*c*) Root morphology of young seedlings.

Some investigations, that were considered to be a necessary preliminary to breeding work in grapes, were initiated in 1932. Besides this, a study of some morphological and other characters of the various grape vine varieties in the collection was also started. Considerable time was devoted to the compilation of data from these investigations.

During the flowering season of 1935 and 1936, some crosses, between the heavy yielding varieties of grapes and those noted for quality, were made with a view to combine and transmit only the desirable characteristics of the parents to the progeny.

The crossing work will be considerably extended both in scope and magnitude from the flowering season of 1937 in April. The scope of work would be—

(*a*) To test the value of different parents for giving the best progeny plants from economic stand-point.

(*b*) To evolve better seedless varieties, that are generally liked by the people as table grapes.

(*c*) To evolve early ripening varieties, giving better performance both regarding quality and quantity of fruits over the existing ones in our collection.

Investigations on citrus diseases are also in progress.

(vii) *Bihar (Sabour).—Progress Report of the Fruit Research Station, C. P. and Bihar, Sabour, for the year 1936-37.*

Introduction.—This station is a joint one for work in the plains for the two neighbouring Provinces of the U. P. and Bihar. This is the third year of the scheme. Besides the work already started, some new lines of work were also taken up during the year, such as experiments on nutritive requirements of mangoes, pruning in litchies, studies on bearing, root studies, and packing and storage work in mangoes and litchies.

The station has been unfortunate in frequent changes in its staff. Due to unavoidable reasons, for the last three years, three officers held charge of the station, each for about a year's duration. This resulted in alteration in the method of approach to various problems, hampering the progress of work. A clear programme has now been prepared.

Mango propagation.—An attempt has been made to find out a cheap alternative to the method of mango propagation in common use, *viz.*, inarching. Budding, cutting have all been tried with little success. At present, therefore, there seems to be no practicable alternative to the existing process of inarching. It is possible, however, to produce inarched plants for sale, within a year. The seeds are planted in June, inarching is done in October and the plants are separated in the following June. By this method 90 per cent success is obtained. A further experiment which will be tried is the elimination of earthen-ware pots (for the stocks) and the substitution for these of straw coverings. Inarching has also to be found the best way of carrying out top-working.

Production of uniform material.—Preliminary experiments have shown that it is possible to cause seedling plants to root on their stems by ringing them and burying the cut surface. It is hoped to do the same kind of thing with grafter plants.

Work on Rootstocks.—Studies of different seedling types selected as possible stocks have been continued and are being judged on their botanical characters and on their vigour of growth. Two mango varieties—Langra and Fazli—have been grafted on four different seedling stocks and their growth is also under observation.

Experiments are being carried out on the best time of planting the mango on the age of the grafts at the time of planting. A very careful study is being made of the kind of branches on which the mango flowering shoots appear and particularly on the periodicity of bearing, *i.e.*, bearing in alternate years. This work must be carried on for some time before definite conclusions can be drawn. The effect of manuring on periodicity of bearing is also under study. The other fruits under experiment are the litchi and the papaya.

(viii) Scheme of research on "Santra" oranges in the Central Provinces.—At its meeting in February 1934, the Advisory Board recommended a scheme for research on the *santra* oranges of the Central Provinces. The scheme was started in 1937, and the Horticulturist, Miss Rajul Shah, took charge on the 30th April 1937. A detailed technical programme of work was received during the year. The Horticultural Research Workers' Conference considered the programme at its meeting held in September 1937, and observed that it should be determined whether root pruning was necessary since it probably had an important practical bearing on die back and other root diseases.

The technical programme was further criticised at the Advisory Board as being too comprehensive. It has now been re-drafted in consultation with the Agricultural Expert.

(ix) *Combined scheme for San Jose' Scale survey in the Punjab and an entomological survey in the North-West Frontier Province.*—As stated in the Annual Report for 1936-37, a combined scheme of work on these problems was organised in consultation with the Governments of the Punjab and the North-West Frontier Province. Work started on the 1st of April 1937, and the technical programme was approved by the Advisory Board which also drew attention to the need for adequate statistical technique in sampling. Work will be carried out under the direction of the Entomologist to the Government of the Punjab and under the immediate charge of Dr. K. Rahman, B.Sc. (Agri.), Ph.D., Assistant Professor of Entomology, Lyallpur. The area to be worked has been divided into the following circles:—

(1) Simla and Kulu.

(2) The Murree Hills.

(3) The Punjab Plains.

(4) Peshawar, Bannu and Hazara.

One entomological assistant is stationed in each of these circles and there is a senior entomologist at Taru Jabba who supervises the assistants at Bannu and Hazara.

(x) *Fruit Research Scheme, Mysore.*—As stated in the previous report the scheme was started only during the year. A detailed technical programme of work was received and approved subject to the condition that details of working would be submitted later.

15. *Dry Farming Research.*—The object of this group of investigations has been stated in detail in previous reports. Briefly the object is the improvement of crop production in tracts of precarious or limited rainfall where irrigation is not practicable. Work is now in full swing at all the five centres.

(i) *Meeting of the Co-ordination Committee.*—A meeting of the Dry Farming Co-ordination Committee was held in September 1937. At this meeting practically all the scientific workers from the various dry farming research stations attended. It was preceded by a meeting of a small drafting Sub-Committee. The Committee considered the progress reports on the several research schemes and the question of correlating their results. Suitable arrangements were also made for an interchange of quarterly progress reports. The report of the drafting Sub-Committee will be found at Appendix IV.

(ii) *Progress reports.*—(*a*) *Bombay Presidency (Sholapur and Bijapur).*—This is the third year during which a full programme of work was carried out in all the three lines, *viz.*, soil, plant and field. Most of the items of work reported in the second year were continued and one or two items were started for the first time at the Bijapur sub-centre so as to complete the full programme as recommended by the first co-ordination committee.

Germination tests with *jowar* seeds showed that the additions of manures like farmyard manure and green-sann do not affect the optimum soil moisture requirements for germination in the medium-deep soil of Sholapur. Wilting co-efficients at three different stages of the Jowar plant did not show significant differences. Developmental studies showed very poor growth of plants in Sholapur medium-deep soil and of those in deep-black soil of Bijapur. Plants in light-shallow soil at Sholapur and

limy soil at Bijapur showed normal growth. Determinations of mineral constituents of the *jowar* plant showed that the quantities removed by the plant varied according to the soil type and also according to the seasonal conditions. Experiments on transpiration of *jowar* plants confirmed the results of the last year which indicated that (A) the loose and the compact types of *jowar* require nearly the same quantity of water to produce a unit weight of dry matter, the actual co-efficient being somewhat higher than 400. (B) Addition of organic and inorganic manures economises the use of water, the co-efficient being substantially lowered to nearly 300. (C) Presence of constant moisture does not influence the co-efficient very much.

Physico-chemical studies of the soil profiles at Sholapur and Bijapur were continued. They indicated the highly clayey nature of the two soil types of Sholapur and of two types of Bijapur. The substitution of the international soda method in place of ammonia method was found necessary for the types of soil found in this tract. The moisture equivalents of the three types of soil of Bijapur showed descending values, depending on the clay contents. The lower layers in the profile showed high values in all types. The hygroscopic moistures again showed variation according to the clay contents. Nitrogen recuperation studies in cropped plots show the same fluctuations as those shown by uncropped plots during the previous season. The disintegration of murum revealed distinct increase in depth of the soil layer, though increase in finer material is limited. Increase in depth is a very promising and useful result, as it is achieved by disintegration *in situ* by cultural operations. Soil moisture studies indicated that the moistures were very inadequate at critical stages of the crop. Losses of rain-water were limited both at Sholapur and Bijapur. The loss of silt was not altogether negligible. Weather conditions during the year were such as allowed nearly the whole of the rainfall received in soil to be lost by evaporation during the same period from both types of soils filled in pots.

Field Work.—The general level of yields of *jowar* crop in all experiments was only 45 per cent of grain and 70 per cent of straw of those obtained in a good season, on account of the great shortage of rain which was only 60 per cent of the normal at Sholapur. But when the yields of *jowar* grain and straw by the Bombay dry-farming method were compared with those of the cultivators' method they were found to be more than double. The increase was due to the combined effect of (A) bunding, (B) ploughing and harrowing, (C) low seed rate and (D) interculturing. In other experiments addition of green sann, fallowing and scooping gave very promising results.

But the real success of the Bombay dry-farming method was conspicuously seen at the Bijapur centre on account of more responsive types of soil, though the rainfall was as poor as at Sholapur. The general yield was nearly two-thirds that of a normal year, though the rainfall was only 60 per cent being only 13·24 inches. The yields of grain and straw by the Bombay Dry-Farming Method were one hundred per cent and fifty per cent more respectively than those by the cultivators' method. In other experiments highly promising results were obtained by fallowing, scooping, sheep-folding and manuring with farmyard manure, The first three treatments gave nearly a hundred per cent increase in yield over the control.

(*b*) *Madras* (*Hagari*).—In the soil physics section, the distribution of soil moisture was the chief item of work. This was studied at frequent intervals in fields receiving different cultural treatments such as "bunding", bunding combined with ploughing once in two years, bunding combined with ploughing once in four years, control and fallow fields.

The effect of the frequency of intercultures on the conservation of soil moisture was also studied. From the figures so far available it appears that the plots receiving three intercultures in cotton and those receiving two intercultures in sorghum are better than the rest from the point of view of moisture conservation. Mere weeding alone gave equally good results in the case of sorghum. This supports the idea that interculture or mulching is only "incidental to the operation of destroying weeds" and by itself may not help moisture conservation.

Studies in soil moisture were also made at the time of sowing and harvest of the crops in the fallowing and manurial series of experiments.

A systematic study of the physical properties of the soils like mechanical composition, real and apparent specific gravity, pore space, water holding capacity, volume expansion and dispersion co-efficient was made for samples taken from different plots. The progressive absorption of moisture at different relative humidities and evaporation of water from soil surface were studied. Gypsum, when applied as a soil mulch, was found to be effective in reducing evaporation of water from the soil surface.

The meteorological instruments were set up during the year and regular observations at 8, 11, 14 and 17 hours local time were taken. Micro-climatic observations with Assmann's psychrometer were made at 8·00 and 14·00 daily in the open and in cropped areas, at different heights.

Root studies of different types of plants were made. Experiments were also carried out on bunding, on cotton spacing and on certain mixtures of crops.

(*c*) *Hyderabad* (*Raichur*).—The year under report marked one of the lean years which not infrequently visit the Dry-Farming Region of the Hyderabad State. This is brought about mainly by the failure of monsoon and consequent inadequacy of moisture for successful crop growth. While conditions at this station for the present year seemed to result in only partial success of the several crops, the centre of distress was located elsewhere in the interior of Raichur District.

Work at this station was continued both on the red (*kharif*) and the black (*rabi*) soils which form the two representative types of this tract. Most of the experiments were duplicated on these two types. It is to be observed here, that the red soils are mostly cropped during the *kharif* season covered by the rainy period of the year, while the black soils are cropped later in the *rabi* season after the cessation of the active monsoon. This practice is closely related to the retentive capacities of the two types, which is low in the former by nature of its sandy composition and very high in the latter, obviously due to its greater clay content.

The rainfall was much below normal and its adverse effects were felt in different degrees by different crops. Cereals like sorghum and setaria suffered the most, while cotton received comparatively less damage. The groundnut crop suffered very badly and had to be removed earlier than its normal period, resulting in very poor formation of pods with ill-filled

seeds. In other words the deeper rooted crops like cotton were more successful than shallow-rooted ones.

(*d*) *Punjab* (*Rohtak*).—This was the second year of the scheme. Experiments were in progress regarding the conservation of soil moisture and deep *vs.* shallow cultivation. There were also experiments on (*a*) the interculture of crops and (*b*) the value of bunds for controlling rain water.

The application of farmyard manure increased the yield of *bajra* significantly and the yields are in the order of the tonnage of the manure applied. Manure also appreciably affected the quantity of water lost from the soil during the growth period of the crop, and the water lost from the soil to produce the same amount of *bajra* grain went on decreasing with the increase in the dose of manure applied. Moreover, *bajra* plants in the manured plots were able to obtain more moisture from the deeper layers.

The application of manure to the *juar* fodder crop made it more susceptible to the attack of stem-borer.

Different strains of the crops sown in the locality, *viz.*, *bajra*, *juar*, *guara*, gram, wheat, and barley were being tried with a view to find out the drought resistant types. In addition trials with the new crops were in progress to find out their suitability under the local conditions. The trials of maize, sugarcane, soya-beans, groundnuts, *mung urid*, and linseed had given encouraging results. It was possible to obtain a good crop of cotton by changing the time of sowing. In the soil section a mechanical analysis was made of 240 soil samples and a study undertaken of the movement of soil moisture and the effect of seasonal variations, soil texture and stirring on nitrification. Some detailed physiological studies were also conducted.

16. (i) *The Soil Science Committee.*—The Soil Science Committee met twice during the year in conjunction with the Advisory Board, *viz.*, in November 1937, and in March 1938. It examined a number of progress reports and technical programmes of work and considered applications for the renewal of certain existing schemes and applications for grants for new schemes. One of the principal items on the agenda at each meeting was the consideration of Sir John Russell's recommendations regarding soil research. A summary of the principal recommendations made by the Committee is furnished below:

Manurial Experiments.—In his report Sir John Russell made several important recommendations on the need for recasting manurial experiments. As a preliminary to this, he suggested that particularly in the case of sugarcane and rice manurial experiments the results of the last five years should be worked up by the Statistician and the new designs made. He also suggested that the Council should try to get the results of properly conducted fertiliser experiments which have been carried out by fertiliser companies. The Soil Science Committee approved these proposals, made a list of the long-term experiment results available from provincial departments and with regard to manurial experiments generally recommended that—

(*a*) the results of only scientifically planned long-term experiments should be considered,

(*b*) the *whole* of the data should be presented to the Council,

(*c*) the statistical interpretation of the results should be checked,

As a result of these recommendations, the Agricultural Expert and the Statistician presented to the Rice Committee and the Advisory Board

the collated results of the rice manurial experiments on rice carried out at the rice research stations aided by the Council during the last five years. It was decided to delay the designing of further experiments until the results of other experiments conducted at stations not financed by the Imperial Council of Agricultural Research and from the fertilizer companies had been similarly collated and considered.

A similar review of the manurial experiments on sugarcane which could be carried out during the last five years at the sugarcane experiment stations financed by the Council is nearly complete.

Soil Erosion. The Soil Science Committee recommended that the Government of India should draw the attention of Provincial Governments to this recommendation and to the relevant recommendations of the Crops and Soils Wing of the Board of Agriculture and Animal Husbandry 1935, and that the Imperial Council of Agricultural Research should consider whether it is possible to bring together all the existing information on methods of avoiding erosion by such agricultural methods as terracing contour planting, small-scale bunding and the like. The Committee agreed that there was no very urgent need for more research on the erosability of various soils apart from what is in progress under the Dry-Farming Schemes.

Soil Map of India.—The Soil Science Committee noted that Sir John Russell's recommendation regarding the preparation of a soil map of India is already being acted upon by the Director of the Imperial Agricultural Research Institute.

Surveys of alkali regions.—In dealing with Sir John Russell's recommendation regarding soil surveys in irrigated regions or wherever the soil was alkaline the Committee suggested that the attention of Provincial Governments should be drawn to the importance of providing adequate research staff for the study of soils which have newly come under irrigation—especially where there are any indications of deteriorations.

Utilization of Waste Lands.—Sir John Russell recommended the desirability of examining cultivable waste lands and reporting how far they can better be utilised. The view of the Committee was that the Council should send some one well acquainted with Indian soil problems to the U. S. A. and Africa to study the new methods of soil conservation and utilisation there being worked out and to report on the applicability of such methods to India, including the reclamation of land tending to become desert.

Proposed Central Irrigation Institute.—Regarding Sir John Russell's recommendation concerning soil research at any future Central Irrigation Research Institute, the Committee agreed that the study of water requirements of crops is primarily a subject for agricultural research stations but that there are many soil problems affecting irrigation departments for the study of which a central Irrigation Research Institute with a competent agricultural staff would be needed. The larger problems of water-logging and alkali are matters for the Irrigation Departments. The Committee also agreed that in view of the fact that dry farming research is essentially agricultural work, the Council should continue to finance dry farming research schemes.

Compost.—After considering Sir John Russell's recommendation on composts the Committee recommended that more work was needed on the comparative value of composts and other fertilisers, the manures being

applied on a nitrogen basis. The following comparisons should be made under a wide range of conditions *viz.*,—

(*a*) compost *versus* no compost,

(*b*) compost *plus* ammonium sulphate *versus* farm manure *plus* ammonium sulphate.

The cost of compost making should be recorded; the Committee hoped that reliable data could be obtained from large private farms.

Recommendations dealing with schemes.—Various recommendations made by Sir John Russell concerning individual schemes or problems were duly considered in connection with the reports on the schemes and in some cases have already been given effect to in the new programmes.

(ii) *Re-constitution of the Soil Science Committee.*—The question of the reconstitution of the standing Soil Science Committee was considered by the Advisory Board in November 1937. It was agreed, after considering Sir John Russell's recommendation, that a rather more comprehensive committee should be set up to deal with all questions of soil fertility, (including fertiliser experiments); and that the reconstituted committee should function for one year in the first instance pending a more detailed consideration of Sir John Russell's Report. It was also recommended that the existing Fertilisers' Committee of the Council should lapse. These recommendations were accepted by the Governing Body and took effect from February 1938. The personnel of the committee will be found in Appendix V.

(iii) *Mechanical analysis and study of physico-chemical properties of lateritic soils and nutrition of the rice plant (at Dacca).*—(1) *Progress report for 1936-37.*—The profile of soils in some of the laterite areas in peninsular, central and eastern India including Buchanan's laterite soils of Malabar has been examined and described.

The profile characteristics of laterite soils in India so far observed in the present study are:—

(*a*) disintegration and decomposition of rock and soil material to a considerable depth,

(*b*) light red colour of the soil material in the surface horizon,

(*c*) slightly acid reaction of the surface horizon passing into neutral or even slightly alkaline reaction in lower horizons,

(*d*) a tendency to formation of honey-combed iron crust in the surface horizons.

Analyses of the different horizon samples of the soil profiles examined are now in progress.

A method of dispersion of soils for mechanical analysis has been described. This method includes treatment of the soil with alkaline permanganate for oxidation of organic matter but is free from any drastic treatment such as with hydrochloric acid.

A study was made on (*i*) the loss of nitrogen from rice soil during the period of water logging and (*ii*) the microbiological conditions existing in the rice soils at different periods of the year.

A detailed study was made on the assimilation and translocation of nutrients in the rice plant grown in—

(*a*) a field unmanured for many years and growing rice every year.

(*b*) the same as (*a*) but manured with Nicifos and lime,

(*c*) water culture.

The Soil Science Committee was of the view that in this general study of Indian lateritic soils it would be of interest to compare their characteristics with those obtained by workers on the lateritic soils of Africa and of the West Indies. The Committee also noted that all the soils at present classified as laterite in India did not show all the four characters mentioned in the report but that there was at present no generally accepted definition of laterite soils.

The Committee also desired that in the next report a review of the position reached in regard to the study of the problem of nitrogen supply to the rice plant should be attempted and that the portion of the work relating to the nutrition of the rice plant should be written up for publication in the *Indian Journal of Agricultural Science*.

(2) *Extension of the scheme.*—The question of further extension of this scheme, which would otherwise expire on the 30th June 1938, was considered in November 1937. The Soil Science Committee recommended that the scheme be extended for a period of two years with effect from the 1st July 1938, at a cost of about Rs. 20,800 but subject to the submission of a detailed technical programme accompanied by a full statement of the results of the last eight years. These recommendations have been accepted by the Advisory Board and Governing Body and the necessary financial sanction has been issued.

(3) *Technical programme.*—The technical programme of work was received and approved in March 1938. The Committee was of the view that it was more important to improve the existing knowledge of these soils than to pursue the improvement and refinement of analytical methods.

(iv) *Research on the properties of colloid soil constituents (by Professor J. N. Mukherjee).*—(1) *Extension of scheme.*—At its meeting held in February 1934, the Advisory Board recommended the extension of this scheme for a period of three years. The extended schemes will expire on the 30th September 1938. The question of a further extension was considered at the meeting of the Soil Science Committee held in November 1937.

The committee considered the suggestion of Sir John Russell, *viz.*, physical studies of the clay by the modern X-ray and optical methods. The Committee desired that Professor Mukherjee should choose a suitable investigation and submit proposals to the Council.

The Committee endorsed Sir John Russell's recommendation that the scheme should be continued. During the course of work Professor Mukherjee would employ post-graduate workers as recommended by Sir John Russell.

The extension of the scheme for a period of 5 years was approved.

(2) *Progress Report for 1936-37.*—As a result of the last six years' work with hydrogen clays and a number of pure colloidal acid systems, for example, silicic acid and palmitic acid sols, useful information regarding the nature of clay acids and of colloidal acids in general has been obtained. The results indicate that colloidal solutions of these acidic substances are definitely poly-phase systems. The solubility and the stability in solution or as a separate solid phase of the salt formed by the interaction with the titrating base must be taken into consideration in

interpreting the titration curves. The mathematical relationships which obtain when the acid and the resulting salt remain in solution are not applicable to these systems. The classical concepts, as is to be expected, adequately explain their properties when equilibrium is established between definite phases and solubility considerations are relevant in such cases. But the reaction in many cases takes place only in the interfocial layer. The characteristic feature of such cases is the existence of a primarily adsorbed layer of ions held strongly by the lattice energy. If, in addition, the anion of the resulting salt is not stable in solution under the conditions and the lattice energy of the solid salt is too weak or its solubility too large to admit of the formation of a separate solid phase or an interpenetrating lattice, then stable ion pairs are formed in the double layer and an equilibrium is established between the interface and the solution. Solubility considerations have no meaning in such cases and the energy relationships indicating the stability of the ion pair constitute the corresponding thermodynamic magnitudes on which a correct representation of the equilibrium can be founded. The core of the particles is neither an actual nor a potential *component* in Gibbs' sense. It is outside the sphere of the interaction. The results obtained with pure systems summarised above have been of material help in indicating the lines of investigation on hydrogen clays.

The total acidity values of hydrogen clay sols obtained by potentiometric and conductometric titrations as carried out in this work have been compared with their base-binding capacities obtained by other recognised methods. Such comparative studies, besides elucidating the factors determining the total acidity, might suggest suitable methods for its determination. The results already obtained permit the conclusion that the titration curves of hydrogen clay sols with bases as obtained in this work, besides elucidating the nature of the interaction of the sols with the bases, give total acidity values in agreement with other recognised methods. Mattson's, Parker's and Hissink's titration methods were employed for the purpose of comparison.

The Soil Science Committee expressed appreciation of the work done by Professor Mukherjee and invited him to publish a corrected account of the work done since the inception of the scheme.

(v) *Investigations of the organic constituents of Indian Soils.*—This is the second report. The work had to be carried out under difficulties as vessels of suitable size were delayed and all the filtrations and washings were necessarily very tedious. Some general conclusions have, however, emerged regarding the nature of the various fractions and regarding the changes produced in the soil organic matter by the re-agents used. The necessity for further work is clearly indicated, and following the valuable suggestions received from Sir John Russell, an extension has already been undertaken, *viz.*, the determination of the equivalent weights of the typical "humic-acid" fractions by conductometric titrations in an apparatus specially prepared for the purpose.

The Soil Science Committee considered that the experiments conducted with the Derby soil should be repeated on a typical soils of the Dacca farm. It was also suggested that future work should be directed particularly to the solving of practical questions connected with the amelioration or improvement of the Dacca soils.

(vi) *The study of soil problems in Bengal.*—Studies on soil moisture under field conditions indicate that in the case of a cultivated land in the Dacca Farm the moisture content of the soil does not vary much below 24 inches. And that below that depth the soil remains at a constant moisture content of about 21 per cent. Down to 24 inches, there is a gradual fall in moisture content. The study of the moisture profile has been extended down to the water table with a view to finding out the exact significance of the constant moisture zone below 24 inches and of studying the behaviour of this constant moisture zone when excessive irrigation is applied to it. The results so far obtained indicate that the addition of water only affects the top layers of the moisture profile.

Studies of physical properties of soils under field conditions were carried out with the help of a dynamometer, to measure the resistance offered by implements and the effect of certain soil factors. The soil moisture factor was taken up first. The resistance to implements was measured at intervals of 3 to 4 weeks during which period the soil parted with moisture and the test continued for 4 months. The relation between the resistance and moisture content as represented by graphical interpolating was evidently a rectangular hyperbolic. The next experiment was directed to the effect of manures on resistance. Soil manure with bone-meal alone recorded the highest resistance which dropped when lime or green manure were used in addition. Green manure alone and lime alone were equally efficient and recorded the lowest resistance. The combination of the two did not lead to any further improvement. Bone-meal therefore should never be used alone; but should be associated either with green manure or lime or both. The above results justify the general practice of adding lime with bone.

Pot culture experiments on the water requirements of the rice plant indicated that excessive watering at the early stage of growth of *Aus* paddy is detrimental to tillering, but at the time of flowering, frequent watering is essential. It follows that water logging at the early stages should be avoided as far as practicable and the land should be given an opportunity of drying. Attempts were also made to find out the real significance of imbibitional water and a method suggested of finding out the vesicular coefficient of soils. It was found that imbibitional water increased or decreased as the colloidal content of the soil increased or decreased.

The Soil Science Committee desired that the standard deviation of the individual figures for draught should be worked out and that it should be considered whether the Dacca farm has adequate equipment for these experiments.

(vii) *Investigations on the relation between the physico-chemical properties and fertility of certain Punjab soils.*—Work was started in December 1931 and a final report has now been received. Prior attention was given to an investigation of the causes for the infertility of the Kalabagh soils and whether the fault lay with the soil or with the water of the Jaba stream. Since the water contained a high percentage of hydrogen sulphide gas and possibly other sulphides, it might be the most likely cause of the infertility of the soil or it might be that the soil itself contained harmful and injurious salts. Suitable methods for correcting the faults of the water or soil would not only make the existing lands productive but would make it possible for the huge tract of 8,000 acres to be reclaimed to profitable agriculture.

With a view to investigate this problem a survey of the land was first undertaken, and the soils and water samples were analysed, and pot experiments performed to study the effect of H_2S gas on plant growth. Fertilizers by the chemical analysis of the soils were tried in the pot experiments and finally the effect of fertilizers on a field scale was studied.

The results of the experiments have shown that these soils are deficient in potassium, phosphorus and nitrogen but that with certain exceptions they are quite fit for successful farming after the addition of suitable manures. They require plenty of moisture and a high percentage of organic matter for yielding good crops.

It was clear from the analysis of water samples that a lot of H_2S gas was present in certain samples, but that near the Jaba village, about 2 miles down the stream, only traces of the gas could be detected due to higher temperature at that time of the year.

The percentage of H_2S which will be finally retained by the water would evidently depend upon the temperature and other physical conditions. It is therefore necessary to ascertain the limit of H_2S that will have no toxic effects on plants.

A comparison of the effect of H_2S gas on the plant growth during winter months to that during summer showed that mineral water containing the gas had a definite retarding influence in winter but no appreciable effect could be noticed in summer. This could only be explained by the fact that during summer months the concentration of the gas was lower than in the winter months.

These experiments require repetition on a large scale in the field before final conclusions can be drawn.

Field Experiments.

The pot experiments indicated that the soil responded to the application of K_3PO_4 and that hydrogen sulphide had definitely retarding influence on the plant growth. It was decided to perform field experiments to test the validity of the pot experiments.

Due to great variations in the mechanical texture of the soil, the yields of the various plots could not be compared with each other but, in the subplots, the effects of manures were very suggestive.

Conclusions and Suggestions.

The experiments have shown that application of superphosphate along with farmyard manure is the least expensive treatment. It is also seen that addition of nitrogen in the form of niciphos and farmyard manure is also very helpful in increasing the yield of the crop.

Farmyard manure is useful for the conservation of moisture due to its organic colloids, especially in a light soil like the Kalabagh soil.

Unfortunately these experiments could not be planned on statistical lines. From the data collected, it is evident that the soils have definitely responded to potash and phosphorus. But to find out the minimum requirements of these soils and also the losses of manures during floods further experiments are necessary.

Along with the work on the Kalabagh estate soils to find out the causes of infertility in them, a systematic study of the physical conditions and chemical constituents of the Punjab soils was undertaken and compared with their fertility.

(viii) *Scheme for the preparation of cheap synthetic manure from the town refuse and waste materials at the Indian Institute of Science, Bangalore.*—Work was started in January 1935 and the scheme has been extended from time to time up to the 2nd January 1940. The object of the scheme is to devise a cheap and efficient method for the conversion of town refuse and other waste materials into synthetic manure. The data show the superiority of the hot-fermented composts; to obtain the full benefit of the hot-fermentation method, when composing night soils, it is preferable to carry out the operation in concrete cisterns. Recently the residual effects of the above treatments have been examined by growing *Jowar* (sorghum) on the same plots. It was found that the plots, to which hot-fermented manure had been applied in the last season, have shown the highest residual effect. The pot culture experiments confirmed the superiority of the hot-fermented manure. In general, it can be stated that even in plot and pot experiments the plants treated with hot-fermented manure grew up more quickly and matured earlier.

A new development, which promises to yield interesting results, is the preparation of a solid product from night soil by mixing it with a suitable proportion of either household ash or coal ash (2 parts of fresh night soil to 1 part of ash). The mixture is convenient to handle, dries quickly and possesses no objectionable odour, so that composting could be carried out near towns.

A second advantage of the preliminary conversion of the night soil into an innocuous solid product is that it is in a convenient form, in which it could later be used for purposes of composting with street sweepings.

Experiments to test the manurial value of night soil—ash mixture and composts—are in progress.

In considering the extension of the scheme, the Soil Science Committee considered that the question of the disposal of the refuse of small towns had been solved and that what was really wanted was an effective means of dealing with agricultural waste material which would give a really good manure. It was, therefore, suggested that Dr. Subrahmaniam should compare the Indore process and hot-fermentation process on village wastes, particularly on the more intractable materials such as cotton stalks. Attention was also drawn to Sir John Russell's recommendation that the results on composts research should be collected and published as a monograph.

17. (i) *Quality in Crops.*—(A) *Rice.*—The quality of rice was studied under two main aspects, the chemical and the biological at Bangalore (under the Biochemist of the Indian Institute of Science) and at Coimbatore under the Rice Specialist.

(*i*) *Investigations at Coimbatore* —During the year under report a laboratory method for determining the cooking values in rice which has been accepted by other Rice Research Officers in India was evolved. It was also found that aeration during storage quickened curing of the rice.

Experiments showed that parboiled rice lost less of soluble matter on cooking than raw rice in so far as very little matter was removed with

its *kanji* (drained-off liquid) as compared to the *kanji* from raw rice. The proteins were found to have diffused into the deeper layers of the endosperm in parboiled rice. Parboiled rice did not lose so much of the proteins on milling and polishing as raw rice.

The presence of the amino-acid tryptophane in the proteins of the aleurone layer in rice made rice a good body-building food, provided it was not lost in polishing.

There were indications to show that the thickness of the aleurone was influenced by manuring with green leaf.

(*ii*) *Investigations at Bangalore.*—Perhaps the most important finding that arose from the present enquiry is that rice is inherently very much more nutritious than it is commonly believed to be. The poor quality of the food that is eaten by a large section of the population in India is traceable to (1) the prevailing taste for white and small-grained varieties of rice, (2) the process of polishing which removes the major part of the valuable phosphorus and a considerable part of the nutritious protein in addition to the essential vitamin, (3) the practice of thorough washing (before cooking) which removes a considerable part of the residual phosphorus and (4) the present method of cooking involving drainage of gruel and consequent further loss of nitrogen and phosphorus. Evidence has been adduced to show that some of the coarser and coloured varieties are very rich in the essential constituents and, if cooked without polishing and without extra washing, are as nearly rich as wheat.

The factors affecting the keeping quality of rice have been determined and it has been shown that the poor keeping quality of unpolished rice is essentially due to the rice oil contained in the embryo and the outer integuments of the grain. It is possible, by suitable control of humidity and storage methods, to prevent or at any rate greatly minimise the deterioration of hulled rice on storage but further efforts should be made to improve the keeping quality so as to be readily applicable in practice. Parboiled rice has got much better keeping quality than raw rice, even when unpolished.

It has been found that disinfection of rice consignments with sulphur dioxide appears to affect the quality of the product although not to a considerable extent. Such rice cooks to a pasty condition and the cooked product has a distinct acidic taste. Some of the factors that control the ill-effects of fumigation have been studied.

From results of extensive feeding experiments with different rice varieties using young rats and pigeons, it has been shown that growth is essentially correlated with composition, particularly protein and mineral contents of the rice samples. Coloured and coarse varieties induce better growth in animals, on account of their higher protein and mineral contents. One of the factors determining growth rate appears to be the level of protein supply and in this connection it is important to determine the supplements needed to make rice a wholesome diet. The availability of the different constituents of rice and the means of increasing them are under study. The effect of parboiling and of polishing on rate of growth with young rats is also being followed.

The chemical composition and nutritive value of rice varieties grown under (1) irrigated, transplanted, (2) irrigated, broadcast and (3) dry broadcast conditions have been studied. Dry cultivated paddy has been

shown to be least nutritious compared to wet cultivated rice. Irrigated broadcast rice is intermediate in composition and nutritive value between the dry and wet cultivated rice. This scheme, which was due to expire at the end of May 1938, has been recommended for a further extension of one year for the present.

(B) *Barley.*—In the last report a brief reference was made to the results of the shipments of barley from the United Provinces, Punjab and Bihar during the season 1935. The samples of barley on 1936 crops were received by the Institute of Brewing from (a) The Department of Agriculture, United Provinces—32 samples; (b) The Department of Agriculture, Bihar—13 samples, and (c) The Department of Agriculture, Punjab—8 samples.

The samples were valued and analysed in the same manner as the samples of the previous years. It has been reported that some of these Indian barleys compare very favourably with the best imported brewing Californian barleys as brewing material for English brewers. The following are some points from the reports:—

The barleys from Raya (Muttra, U.P.) were equal in appearance, and fully equal in malting quality to best Californian. Those from Kalai and Kunra Ghat were nearly as good. The Kalianpur and Sabour barleys were considered about equal to Chilian Forage barley, of which a good deal is malted for English brewers. In the case of these, again the malt made was never below, and in about 30 per cent. of the barleys malted above the quality expected from the appearance of the barley sample.

In the case of the Punjab (Lyallpur Farm) the appearance of the barley was against it in market valuation: but in 5 cases out of 8 the malts turned out better than expected, and the extract value was exceptionally high.

It should be noted that high nitrogen content does not seem to affect the malting quality of barley grown in India to the same extent as of that grown in Europe. In this respect Indian barleys seem to resemble "Manshuri" type rather than Mediterranean type barley. With regard to value, it appears obvious that barleys of the type grown in Raya, Kalai and Kunra Ghat would when their malting quality is recognised, compete favourably with Californian barley. The barleys from Kalianpur and Sabour compare well with Chilian Forage barleys which many brewers in this country now use.

The barleys from Lyallpur were poor in appearance (many brewers would consider them "coarse" and be prejudiced against them). But here again the malts made were superior to the promise of the barleys, and when brewers recognise their value as brewing material should be obvious.

The samples this year were clean and free from foreign matter. Those from Kunra Ghat would have been greatly improved by having been passed over a 2 mm. screen. Sample R from Sabour only weighed 27·8 grams per 1,000 corns (dry weight) and its market value was prejudiced by its small size. It is however essential that barley imported from India should arrive free from infection by the khapra beetle (*Trogoderma granarium*).

(ii) *Investigations on the chemistry of malting cholam.*—The scheme relating to malting of cholam has for its objects (1) the better utilisation of the enormous quantities of cholam (grown on about 5,000,000 acres in Madras Presidency), (2) the development of malting of cholam as a cottage

industry and a large scale industry, and (3) the replacing of a portion of the imported malted and breakfast foods by similar products made from cholam.

The criteria adopted in the choice of varieties of cholam were practically the same as those adopted for barley for brewing purposes *i.e.*, low protein content, the object being, to secure a high yield of "extract" or solubility of malt meal in hot water. Periyamanjal cholam, which is grown under rainfed conditions and with a low protein content, has been chosen for bulk trials and was found to be satisfactory.

In continuation of last year's work on the determination of steep—ripeness of different varieties of cholam—attempts were made to study the development of acidity during continuous steeping conditions in the case of Periyamanjal cholam.

Investigations are in progress to study to what extent this acidity is due to bacterial action, and to what extent this is due to outward movements of ions from the material of the seed, by soaking polished and unpolished cholam, sterilised by different methods in distilled water and tap water. A steeping device has been constructed and found to work fairly satisfactorily.

The keeping qualities of cholam malt flour have been found to depend upon (1) the variety and quality of cholam, (2) conditions under which the malting operations had been conducted, especially the roasting process, (3) the method of packing and temperature of storage and (4) the initial moisture content of malt flour.

Vacuum packing of malt flour with and without admixture of dried milk powder is also under study. At the instance of the research station, the Agricultural Engineer to the Government of Madras has been successful in devising a machine for polishing cholam. At the suggestion of Sir John Russell arrangements are being made to have the malt from Cholam tested as an infant food.

18. *Research on oilseeds.*—(i) *Research on Groundnuts in the Madras Presidency.*—The scheme was commenced on the 22nd January 1937 and a report covering the brief period of about two months ending March 1937 was submitted. The Botanical Sub-Committee, which examined the report, commented on the great difference in the proportion of kernels to pods obtained from the same varieties of groundnuts as grown in the Punjab and Madras and recommended that, for the purpose of comparison the oilseed Specialist, Madras, should send a number of varieties for an environmental test in the Punjab.

(ii) *Research on coconuts in the Madras Presidency.*—The object of the scheme is to investigate several problems in connection with the yield of nut, yield of copra and yield of oil and the manufacture of coir. The Madras Government already maintains four stations for research on coconuts on the west coast of India. This scheme is designed to enable the work at these stations to be extended. The detailed technical programme of work was received and approved during the year. Financial sanction was conveyed in May 1938.

(iii) *Research on linseed in Bengal.*—The scheme was started on the 1st October 1936. The essential features of this scheme were explained last year. The technical programme of work has been received and approved.

(iv) *United Provinces scheme for the supply of decorticated cake for educational propaganda.*—The Indian Oil Crushing Industry Committee in April 1933 considered the question of encouraging the cotton seed oil industry in India and arrived at the conclusion that the only way to avoid the economic loss resulting from the practice of feeding uncrushed cotton seed to livestock by the agriculturist was to build up a demand for cotton seed cake through the agency of Provincial and State Agricultural Departments. An enquiry was made from these Agricultural Departments as to how much cake they would take in the event of satisfactory arrangement being made for its supply. The replies received showed that about 1,000 maunds say 40 tons would be required per year for experimental purposes in Government and State farms.

In India the cultivator uses cotton-seed instead of cotton cake as a feeding stuff, though the latter (if decorticated) is one and a half times more nutritious than cotton-seed on account of its higher nitrogen content. Vigorous educative propaganda is therefore necessary, and a supply of decorticated cotton cake, to overcome existing prejudices. Practically the whole of the cotton seed produced in India is consumed as cattle food in the uncrushed form.

The Harcourt Butler Technological Institute, when equipped with the decorticating plant, will be in a position to provide cotton-seed decorticated cake to the Agricultural Departments of various Provinces at cost price, which will be 25 per cent. above the cost price of the seed. The propaganda work is to be taken up by the Agricultural Departments of various provinces. The Imperial Council sanctioned a grant of Rs. 10,000 for the decorticating plant and the scheme was started in November 1937. During the year a technical programme of work was received and approved.

(v) *Research on oilseeds in the Punjab.*—This scheme for additional research on oleiferous *Brassicae* crops, viz., *toria*, *sarson* and *raya* was started in September, 1936.

"Mass-selection" has been the chief method followed for the improvement of *toria* and brown-seeded *sarson* and has resulted in the evolution of highly improved strains, which are now in great demand. To keep up the improvement achieved in these strains and to maintain their stability, a definite scheme of continuous selection and multiplication of seed has been put into operation. A number of other methods of group-breeding, such as brother and sister mating, crossing between self-fertilized lines, and plant-to-row test, for which certain obvious advantages can be claimed over the mass-selection method, have also been started and results of great value are expected in due course.

In yellow *sarson* and *raya*, which are normally self-fertile, a large number of unit species have been isolated and described. *Raya* type O. B./1 has given the best results so far and being drought resistant has a great future in certain *barani* areas. Trials with this and other promising types are being continued.

The study of the crosses between self-fertile and self-sterile forms of *Brassicae* up to F_4 has yielded very interesting results with regard to the inheritance of certain important morphological characters. As a result of these studies 25 new, true-breeding, self-fertile hybrids differing in seed colour and other morphological characters have been evolved.

The problem of taxonomic classification of the chief oleiferous *Brassicae* crops, about which much confusion exists at present, is being tackled in collaboration with some other botanists in India, so as to arrive at a common basis of classification. The morphological and other characters of plants derived from a wide collection of the so-called species of the genus *Brassicae* have been studied in detail. Many new characters of importance likely to be of great use in the classification of these plants have been brought to light.

Interesting data have been collected from the study of the effect of different manurial, hydraulic and sowing-date treatments on the growth of plants and oil-content of seeds.

The Botanical Sub-Committee which considered the report recommended that the Council might commend the proposal to local Governments concerned saying that it would very much appreciate if facilities were afforded to their oilseed botanists concerned to meet annually at one of the centres to compare their results. The oilseed botanists accordingly met at Lyallpur on the 9th February 1938.

The Sub-Committee was also of the opinion that there should be no overlapping of work between the Provinces and the Imperial Agricultural Research Institute. The genetical work required more attention and it was therefore suggested that work in regard to classification would more appropriately continue to be done at the Central Institute and not in Provinces.

The Sub-Committee was further of the opinion that while satisfactory self-sterile races had been produced, the implications of self-sterility and self-fertility regarded from the standpoint of pure genetics required a great deal more study and interpretation. This subject was considered more suitable for the Central Institute.

(vi) *Research on oilseeds in the Central Provinces.*—The scheme was approved in 1935, funds were allotted in June 1936 and the scheme was started in February 1937. During the year under report the technical programme of work was received and with certain modifications approved by the Board. It was recommended that work should be concentrated mainly on selection and acclimatisation.

(vii) *Castor Research Scheme, Hyderabad.*—The Scheme aims at a scientific investigation into the possibilities of increasing the seed and oil yield of Indian castor, so as to bring in larger monetary returns to the Indian castor grower than at present. The work is located at the Main Agricultural Experiment Station, Himayet Sagar, a few miles out of the metropolis of His Exalted Highness the Nizam's Dominions. In the first year 126 samples of castor seed collected from all over India were planted and studied as distinct from the work that had already been in progress in the State from the year 1928-29. The latter work consisted of the study of a number of single-plant cultures with reference to their seed and oil yield and morphological characters. The two operations were amalgamated in the year 1935-36 for reasons of administrative convenience and better collaboration.

Preliminary Yield Tests were run with 33 high yielding, 7 monospiked and 4 non-spiny cultures. They were laid down and interpreted according to Fisher's Method of Randomized Blocks and Analysis of Variance respectively. The object was two-fold; first, to obtain helpful indications enabling us rapidly to eliminate the heterogenous and undesirable material, and,

secondly, to set up standards of seed and oil yield of the cultures under study as a guide to individual plant selection and retention of single-plant cultures.

Study of Single-Plant Cultures was carried out on a plant-to-plant basis in groups founded on important characters like high seed yield and mostly female or pistillate spike, earliness, high oil content on the whole seed, etc., etc. In all 150 cultures were studied. The object is the isolation of desirable types in a pure state. Careful self-pollination was done.

Preliminary work on Inheritance Studies of various contrasted characters in castor was begun. A number of such morphological characters have been taken, the idea being the evolution of lines homozygous for the factor pairs determining particular characters. 56 cultures were under observation.

Newly Acquired Samples of castor, 7 in number, were grown and studied. One of these has been retained for further work.

Good District Cultures (*i.e.*, cultures evolved at the district farms of H. E. H. the Nizam's Government previous to the launching of the All-India Castor Improvement Scheme) were tried out against the local castor in preliminary yield tests.

The Advisory Board considered that the system of experimentation and the interpretation of results required improvement. The Assistant Agricultural Expert to the Council has since visited the station with a view critically to examine on the spot the work done and to make recommendations for its improvement.

(viii) *Research on coconut root disease in South India.*—The scheme was started on the 8th March 1937. During the year the technical programme of work was received and approved.

19. (*a*) *Research in plant physiology by Mr. Bosi Sen.*—The scheme, which was sanctioned at a cost of Rs. 7,500 spread over a period of three years, started work on the 14th September 1936. The extension of the scheme for a further period of five years from September 1939 at an average cost of Rs. 5,000 per annum was recommended by the Advisory Board in March 1938.

The results of the observations so far carried out may be summarised as follows:—

(i) The active protoplasm of the root-hair of *Azolla* exhibits practically all the characteristics of a suspensoid which distinguishes it from an emulsoid, *viz.*: (*a*) the ultramicroscopic pictures show bright particles in vigorous Brownian movements; (*b*) the electric charge of the protoplasmic colloids, not only of the *Azolla* root-hair but also of the petiole-hair of the stinging nettle (*Urtica dioica*), and of the germinated pollen tubes of Sweet peas (*Lathyrus odoratus*), *Petunia* and Madonna Lily (*Lilium candidum*) is negative and cannot be reversed; (*c*) very high concentration of electrolytes is not required to flocculate active living protoplasm and this flocculation, unlike that of an emulsoid, is irreversible; (*d*) low viscosity of active protoplasm.

(ii) The dispersion medium of the living protoplasm of the different cells mentioned above in (*b*), appears to be an aqueous solution.

(iii) The immiscibility of protoplasm and water is due to the presence or formation of the pasma-membrane. When the membrane is destroyed or the conditions for formation of a membrane are absent, the protoplasmic mass diffuses freely in water and aqueous solutions.

(iv) The morphological existence of a plasma-membrane differing in chemical composition and elasticity from the bulk of the cytoplasm can be demonstrated in *Azolla* root-hairs.

(v) The normal plasma-membrane of the *Azolla* root-hair, and also the membranes formed round beads of protoplasm of plasmolysed hairs, show similar permeability reactions to different cations. The permeability of both increases when they are effectively stimulated by an induction shock.

The following is the summary of results so far obtained (July to December 1937) from the studies on the vernalisation of mustard:—

Experiments with mustard (*Brassica juncea* Hooker), Type 27, were undertaken to find out whether mustard seeds could be effectively vernalised and this with a view to their possible agricultural use.

Seeds in two different stages of germination, *viz.*, (A) soon after sprouting and (B) seeds with unsplit seed coats previously soaked under water for 24 hours—were subjected to different periods of low temperature.

Results so far observed from July to October 1937 sowings alike in pots and in small garden plots clearly indicate that:

(i) Plants from both (A) and (B) types of vernalised seeds show definite earliness in the opening of first flowers as compared to the plants from control seeds grown under similar conditions.

(ii) For the same dose of chilling the degree of vernalisation induced in sprouted seeds is much greater than that induced in unsplit seed.

(iii) Against this one advantage of the sprouted vernalised seeds, unsplit vernalised seeds offer several and these are of more significant nature for purposes of practical agriculture.

Experiments are planned for 1938 to find out the maximum degree of vernalisation that can be induced in unsplit seeds by increasing the dose of chilling and also to determine the number of days unsplit vernalised seeds can retain the effects of vernalisation when dried.

(*b*) *Investigation of an electric method of Hygrometry.*—Most of the research work done during the year 1936-37 has proceeded along the lines already indicated in the report submitted previously. The carbon line has now been replaced by a film of colloidal graphite, and so it is now possible to obtain results reproducible by other workers. A series of experiments show that the increase of resistance of the film with time when it is placed in a humid atmosphere is essentially a discontinuous process; the discontinuities however, are slight, and can be neglected. Next the

carbon film was replaced by other conducting films. As a result of these experiments it is established that the increase of resistance of a carbon film when placed in water vapour, is a particular case of a large run of phenomena; a similar effect is shown by all conducting films when placed in suitable vapours.

Recently an electric analogue of the Assmann's Psychometer has been tried. The dry temperature reading is obtained as the value at which the rheostat must be adjusted to obtain the wet and dry bulb difference reading directly as the percentage humidity. The instrument, however, reads the absolute humidity. The values obtained are fairly satisfactory and it might be possible to replace the mechanical adjustment of the rheostat by an automatic relay.

The final report is awaited.

(c) *Agricultural Meteorology.*—Work under this scheme has been steadily progressing. The progress report for the period 22nd August 1935 to 31st March 1937 was received during the year and considered by the Soil Science Committee and the Advisory Board in March 1938. Work on the "experimental" or "biological" aspects of agricultural meteorology and co-operation with agricultural institutions and workers in India formed the major items of the programme. Some investigations of a statistical nature were completed. Considerable attention was devoted to the subject of frost warnings and experiments of frost prevention. The issue of warnings for untimely or heavy rainfall in the Bombay Presidency was also arranged on an experimental basis. The scheme is continuing and the question of placing it on a permanent footing is under the consideration of the Central Government.

(d) *Grant to the Statistical Laboratory, University of Calcutta. (Professor P. C. Mahalanobis).*—This scheme for statistical studies was originally sanctioned for three years in the first instance and work was started in July 1931. The present scheme was sanctioned for five years in 1934-35 and will expire at the end of March 1939.

Originally, it was intended to take up purely theoretical studies relating to experimental error, but, as numerous enquiries relating to agricultural research began to come in form all over India, the scope and nature of the work was altered considerably. A brief report of the work done during the period July 1931—September 1937 is given below:—

Enquiries relating to the application of statistical theory to agricultural investigations of all kinds were attended to from all over India. The number of such enquiries received during the last two years, 1935-36 and 1936-37, was 61 and 84, respectively, with an average of over seventy per year.

A series of "Statistical Notes for Agricultural Workers" was started in the Indian Journal of Agricultural Science, of which twenty-three numbers were published up to July 1937.

A good deal of advisory work was also done in connexion with various agricultural committees.

Since July 1932 special courses of training in statistics have been given to seventy-one agricultural officers who were sent by various Provincial Governments, Indian States, Universities and scientific institutions from all over India.

A new method involving the use of matrices and hyper-geometrical representation has been developed for studying the exact distribution of statistics in samples drawn from normal multivariate correlated populations. Most of the known distributions have been obtained in a unified and simpler way by this method, and a number of new results have also been reached.

Another special line of work has been developed in the theory and application of the D^2—statistic, the object of which is to formulate a quantitative system of classification of biological varieties based on measurements of more than one character.

The moment co-efficients of the D^2—statistic has been the subject of two papers by Professor S. N. Bose. The question of further extension of the scheme was considered by the Advisory Board in March 1938. The usefulness of this scheme in its various aspects was recognised and a three years' extension at a cost of about Rs. 43,000 was recommended.

20. *Cost of Production of Crops in India.*—The enquiry into the cost of production of crops terminated in the remaining Provinces of Bihar and Bengal in the end of June 1937 and the relevant data were received at the headquarters for compilation. The work of drafting the report and the compilation of data was carried out on the lines approved by the Joint Sub-Committee at its meeting held in April 1937. The rough draft report for all Provinces, but not for the three states, co-operating in the enquiry was ready by the end of October 1937 and was submitted to the Joint Sub-Committee which met at New Delhi on November 15, 1937 to consider the same. The committee suggested certain alterations and additions and it was decided to publish the report in nine volumes, one for each province and one for the states under the enquiry. Each volume will contain the all-India preliminary chapters.

The report is being revised in the light of Committee's suggestions. The Punjab volume is already in the press. The other volumes are also being revised and each will be issued as speedily as possible.

21. (i) *Sugar Committee.*—The Committee was reconstituted and enlarged with effect from the 5th June 1937. A list of members is given in Appendix VI.

Meetings.—The Sugar Committee met twice during the year.

In May 1937 the Committee considered the progress reports for 1935-36 and a few technical programmes of work on research schemes financed by the Council. The question of the extension of sugarcane cultivation in India was discussed and it was agreed that in view of the increases which had taken place and of the increase in yield per acre, there was no scope for any general increase in the cane area but that the present distribution was imperfect. It was considered desirable to take stock of the performance of all the sugarcanes now grown in India and the Imperial Sugarcane Expert was requested to prepare a list of them with a statement indicating their behaviour in different places and remarks as to their usefulness. It was also suggested that the results so far obtained in manurial, cultivation and irrigation experiments should be summarised. Emphasis was laid on the need for the appointment of a specialist in the biological control of sugarcane pests to organise work in India. The Committee reviewed the working of the Sugar Production Rules, 1935, and approved experiments on the ratooning of sugarcane at two Agricultural stations, one in

the United Provinces and one in Bihar, at a cost of Rs. 59,000, spread over a period of five years.

In March 1938 the Committee considered thirteen progress reports and ten proposals for the renewal of existing schemes. The Committee also recommended an expansion of the scheme of work on the insect pests of sugarcane, in Provinces other than the United Provinces, Bihar and Bombay. Proposals for the continuation of the Sugar Marketing Survey conducted by the Agricultural Marketing Adviser to the Government of India were considered and approved. The Committee also approved a summary of some practical results of sugarcane research in India and desired that a similar publication should be issued annually, giving a short account of the outstanding achievements recorded in the progress reports of *each year*. The action taken on the recommendations of this meeting will fall within the scope of next year's report.

(ii) *Funds for Sugar research.*—The following grants were received during the year:—

(*i*) Instalment of block grant for sugarcane research . .	1,75,000
(*ii*) Special grant for ratooning experiments and insect pests of sugarcane, etc.	2,50,000

Early in 1938-39, the Government of India made a grant of Rs. 3,50,000 to enable the Imperial Council to finance certain approved schemes.

(iii) *The Sugar Marketing Survey.*—In May 1937, the Sugar Committee approved a scheme submitted by the Agricultural Marketing Adviser to the Government of India for a sugar marketing survey. The survey was started on the 1st December 1937 and the expenditure during the year 1937-38 was met from a special grant of Rs. 10,000 made by the Government of India. The Governing Body have since approved of the financing of the scheme from the 1st April 1938 to 31st December 1939 from the sugar research funds of the Council, at a cost of Rs. 46,500.

(iv) *Research on the Insect Pests of Sugarcane.*—The Council is financing the central portion of a scheme of research on insect pests of sugarcane. The work is being done at the Imperial Agricultural Research Institute, under Mr. P. V. Isaac, Second Imperial Entomologist. The work was started at the end of 1935 as soon as Mr. Isaac returned from his tour of sugarcane-growing countries.

The original scheme for research on insect pests worked out by the Sugar Committee of the Council included a section to be carried out in Provinces and financed by Provincial Governments. The Advisory Board and Governing Body decided that the central portion of the scheme should be started first.

The Provincial Governments found themselves unable to finance the provincial part of the scheme, and it became necessary to consider again how this part was to be financed since, without it the central portion of the scheme could not function properly. Meanwhile damage from insect pests and particularly borers, was attracting much attention from growers and manufacturers. At the meeting of the Sugar Committee in May 1937 Dr. Haldane (Chief Chemist of Messrs. Begg Sutherland & Co.), placed before the Committee some important figures regarding the amount of damage done to cane by borers. In September 1937 the Government

of India were pleased to make a special grant of Rs. 1 lakh for work on sugarcane insect pests. A sum of Rs. 40,000 was set aside for the special investigation in biological control and after discussion by a Committee of Entomologists last November the Advisory Board decided to allocate the balance, *viz.*, Rs. 60,000, to finance three stations in the United Provinces, two in Bihar and one in Bombay as part of the provincial section of the insect pest scheme. This proposal was approved by the Governing Body and funds have been allocated.

At its second meeting the Sugar Committee decided to utilise part of the further grant of Rs. 3·5 lakhs to increase the number of these stations which will now be as follows:—

United Provinces	4
Bihar	3
Punjab	2
Madras	2
Bengal	1
Bombay	1
Orissa	1
Mysore	1
Hyderabad	1
	16

Ratooning experiments.—The question of ratooning is also closely connected with the sugarcane pest problems. As stated in the Report for the last year, a special Technical Sub-Committee was appointed to work out details of an experimental scheme to get accurate information as to the effect of ratooning on the incidence of insect pests. This Committee recommended that an entomological survey be made for one year, and that ratooning experiments be started at once at two stations in the United Provinces and Bihar for a period of 5 years (to be extended to a further set of 4 more stations in a year or two). The entomological survey part of this scheme was dropped as this work will now be done by the special staff employed on work on sugarcane insect pests in the Provinces. A grant of Rs. 59,000 has been made to the Government of the United Provinces and Bihar for these experiments (one in each Province). The lay-out of these experiments is under discussion with the Agricultural Expert and Statistician. They will be started this year (1938).

(v) *Progress Reports on Research Schemes. Annual Report of the Sugarcane Research Scheme, Anakapalle, Madras, for the year 1936-37.*—In a comparative study of yield of different varieties of sugarcane Co. 419 gave the best yield (212 maunds *gur* per acre) an increase of 69 per cent. over the control (Co. 213). There was little difference between the yield of P. O. J. 2878 and Co. 213. It was shown by experiment that setts from a richly fertilised crop would not produce a good yield without normal manuring of the crop from these setts. Molasses applied as a manure up to an amount representing 78 lb. N. per acre gave increased yields, but was not so efficient as sulphate of ammonia or groundnut cake. In a ratoon experiment in wet land of all the varieties tried Co. 281 gave the

best yield (121 maunds *gur* per acre), M. A. 21 and J. 247 almost failed completely, indicating that they were not suitable varieties for ratooning. Cultural treatments for finding out the best time for planting and harvesting cane indicated that cane planted early in the season preferably February-March gave a heavy tonnage and cane planted in July and after takes more than 12 months to mature (sometimes up to 18 months). In an experiment to study the cane crop grown under adverse conditions Co. 419 showed the best yield both in early and late plantings. Early planting (February) gives good tonnage provided there is a fair amount of rainfall in the hot weather season, study of the possibility of raising cane in dry land purely under rainfed conditions showed that the crop planted in the month of October took one year and a half to come to maturity, and the yield, colour and consistency of jaggery of such canes were not satisfactory.

Annual Report of the Sugarcane Research Station, Gudiyattam, Madras, for the year 1936-37.—In a comparative yield trial with Cos. 281, 313, 243, 213 and J. 247 under restricted conditions of growth (75 lbs. nitrogen and 13 irrigations) all the Co. varieties showed significantly higher yield than the control (J. 247). Co. 281 with 20·56 tons cane per acre was the best in these conditions. in another varietal trial which included Co. 419, P. O. J. 2878, Co. 408 and J. 247 under normal conditions (150 lbs. nitrogen and 21 irrigations), Co. 419 gave the best yield, *viz.*, 69·89 tons cane per acre. Twenty-four varieties were studied in observation plots under two sets of conditions, *i.e.*, normal and restricted, along with the local varieties, *e.g.*, J. 247, Fiji B., etc. Promising varieties will be selected after further intensive study before release.

Annual Report of the Sugarcane Research Scheme, Padegaon, Bombay-Deccan, for the year 1936-37.—A new type of survey has been undertaken on different canals to ascertain the extent, origin and nature of deteriorated soils in general. Studies in the so-called "chopan" soil have shed considerable light on the probable behaviour of these soils under perennial irrigation. These results are likely to help in bringing under cane areas in the canal zone at present considered unfit for cane.

In the Crop Physiology Section a critical examination of the growth data in relation to the meteorological factors have shown that while humidity is the controlling factor, velocity of germination, proximity of subsoil water table, and judicious manuring can act as ameliorative measures for mitigating the effect of adverse climate during the growing period. Humidity is also observed to accelerate the activity of the stem borer (Diatrtrea sp.). Its ravages could be, however, greatly checked by increasing the vigour of the shoot either with a basal dose of superphosphate or early planting.

As the result of water requirement studies it has been found that while in general there is a stimulation of the vegetative activities with increasing doses of nitrogen, the higher dose of water tends to diminish it by hastening flowering and maturity.

Biochemical investigations on the optimum manurial requirements were continued during the season with the improved method of the distribution of the top dressings up to 450 lbs. nitrogen per acre has been given instead of the 300 lbs. nitrogen of the previous seasons. The results are

still further increased yield. Sand culture studies have shown the lower concentration of mineral nutrients to be more efficient from the standpoint of the growth of the cane but mineral intake is increased with higher concentration. The association of low nitrogen content with the golden yellow colour of *gul* is further confirmed by the analysis of *gul* from different varieties.

From the manurial experiments there are unmistakable indications that phosphorus is a useful additional manurial element, best given as superphosphate.

As a basal manure groundnut cake out classed both farmyard manure and compost.

In the final varietal trial of January planting, varieties Cos. 412, 413, 414, 416, 417 and 419 in the second year of testing and the varieties Co. 421 and Co. 426 in the first year of testing were grown in comparison with P. O. J. 2878 and Pundia. Out of these Co. 419, Co. 413, Co. 421 and Co. 426 outyielded P. O. J. 2878 and Pundia both in tonnage and sugar, whilst Co. 416 surpassed P. O. J. 2878 and Pundia in tonnage only. Co. 416 gave the highest tonnage, *i.e.*, 50·13 tons cane per acre, Co. 419 was next with 44·96 tons. As October planted crop Co. 407, Co. 408, Co. 413 and Co. 419 have shown the same trend of high yield as in last year. As a ratoon, Co. 419 proved to be the best when compared with other selections, if the new arrivals Co. 434 appears to be promising. Sugarcane sorghum hybrids—Co. 352, Co. 353 and Co. 356 when planted in January and also in June have not reached maturity even in nine months. The varieties Co. 419, Co. 421 have also proved good varieties for *chopan* soil in addition to the others mentioned in last year's report.

Sugarcane seedling testing station, Dacca.—During the last 5 years of work 10 varieties, *viz.*, Cos. 270, 299, 331, 370, 375, 381, 386, 407, 408 and 421, have successfully come out of the preliminary trials and are now undergoing final trials. Co. 381 is definitely an early cane with the defect that it has poor tonnage. Of the midseason canes, Co. 270 is high yielding but it is apt to spread out badly in the field and lodge. Of the late variety canes Cos 408 and 421 stand out pre-eminently as the most high yielding.

This year 15 varieties have undergone pre-final trial. Of these Cos. 508 and 518 are promising as early canes with fair tonnage and good field habit. The varieties Cos. 371 and 432 promise to be high-yielding late canes.

Sugarcane research in the United Provinces at Shahjahanpur and Muzaffarnagar.—Work during 1936-37 was chiefly a continuation of the experiments of the previous year, with a few changes found necessary in the light of the experience. The general agronomic and chemical work at Shahjahanpur is not financed by the Imperial Council of Agricultural Research, but has been included with a view to give a co-ordinated picture of the research work undertaken. Different lines of investigations were in progress, namely,

Varietal,

Agronomic, (including cultural, manurial, irrigational and other botanical studies at Shahjahanpur and Muzaffarnagar substation),

Chemical,

Physiological, and

Entomological (at Muzaffarnagar sub-station).

Among the early varieties under study at Shahjahanpur Co. S. 76 is promising. Of the medium and late maturing varieties Co. 421 and Co. 312 proved the heaviest yielders.

Nitrogen up to 200 lbs. per acre increases cane yields. Additional potash and phosphates provide an insignificant increase in yield. Molasses to the extent of 270 and 180 maunds gave appreciably increased yields over 90 maunds and no treatment. Green manuring with *sanai* is most effective after a growth of 50 days. Inversion of whole *sanai* proves best roots. Five irrigations of 80,000 gallons (or 3·53 acre-inches) per irrigation have given the largest cane yields. For sugarcane at least two hoeings are essential and a deep one should be followed by shallow and surface hoeings. January to February is most suitable for planting.

In *Muzaffarnagar*, Co. 312 has given the best yield so far, Cos. 313 and 244 are both inferior. Co. 244 does not seem to respond to heavy manuring as the other two are seen to do. Among early varieties Co. S. 75, Co. S. 60, Co. 411 and Co. S. 76 are equal in yield but better than Co. 385 probably due to the poorer germination which the latter gave. From among the medium and late canes Co. S. 70, Co. 312, Co. 421, Co. S. 57 and Co. S. 74 give similar tonnage. Co. 393 is distinctly inferior.

Experiments have been carried out to find the effect of the various organic and inorganic manures, time of application of chemical fertilizers, response due to potash and phosphates, effect of artificial irrigation. The optimum spacing of cane rows appears to be 3 ft. apart. Wider spacing require heavier doses of nitrogen (120 to 180 lbs. N.).

Detailed studies in the inter-relationship of nitrogenous manuring, water supply and sowing data were continued.

A physiological study of certain cane varieties known to be drought resistant, medium resistant and drought susceptible was undertaken with respect to germination, tillering, leaf area, cane height, arrowing, yield, water-content of leaves, etc.

Nutritional studies were conducted in pots. Plants were grown in sand culture in a complete nutrient solution containing nitrogen, potassium, phosphorus, magnesium, calcium, manganese, iron and boron and in cultures lacking these elements.

Ecological studies of cane pests were continued. The incidence of borers, Pyrilla, white-fly and white ants was investigated in different cane varieties, under different manurial conditions, times of planting, cultural and mechanical treatments and under water-logged conditions. Further progress was made in the study of the natural enemies of cane pests. Co., S. 60 and Co. 312 proved to be significantly resistant to the attack of cane borer. Co. 411 is one of the most resistant variety to top-borer, among the early varieties and Co. S. 70 and Co. 421 among the later ones. Long periods of intermittent dry weather during the monsoon are very conducive to the severity of Pyrilla attack which can be minimised if stripping and removal of dry leaves is systematically carried out on the standing cane crop.

The Sugar Committee recommended that while pot-culture experiments should be continued, they should not be regarded as a principal line of research.

Sugarcane research in the Punjab.—Experimental work on varieties and manuring, irrigation along with mycological and entomological work has been carried on at the Sugarcane Research Station, Risalewala near Lyallpur and at the Government Farm at Jullundur.

The *maximum* yields from experimental plots at Risalewala during the last three years, *viz.*, 1934—36 were 142, 149 and 159 maunds of *gur* per acre respectively. The *average* yields from about seven acres under the main experiments were 89·4,89·5 and 100·1 maunds at Risalewala and 85·1 and 102·0 at Jullundur (1935-36 and 1936-37 only).

The *average* yield for the Province is less than 30 maunds of *gur* per acre. Top borer and Pyrilla were kept in control on these two stations. These pests were, however, reported in an epidemic form from certain localities, particularly from the central districts of the Punjab. Attack of root borer in a rather serious form was observed for the first time at Risalewala.

The manurial experiments generally indicate that:—

(i) the increase in yield is not proportional to the increase in the dose of nitrogen.

(ii) the combination of toria cake or sulphate of ammonia with farm yard manure to make up 140 lbs. nitrogen per acre gives better and more economical returns than if the same dose of nitrogen is applied as farmyard manure alone.

(iii) 175 lbs. nitrogen per acre (70 lbs. nitrogen as farmyard manure +105 lbs. nitrogen as sulphate of ammonia) gave the highest net profit, *viz.*, Rs. 54-4-0 per acre.

Sugarcane research in Bihar.—This is the fifth year of the scheme. Due to favourable weather conditions during the year under report crops on the experimental plots at the Station were the best since the earthquake. Co. 421 and Co. 513 were outstandingly the best mid-season varieties and appeared serious rivals to Co. 213. Mill tests of these two varieties in the coming cane crushing season should decide their acceptance or otherwise to the mills. Co. 331 has agriculturally been uniformly good over the whole Province but its chemical performance was rather erratic in North Bihar. At Kanke (Chotanagpur) it established its superior ratooning powers. Co. 299 while finding increasing favour with millers north of the river on account of early ripening and maintenance of economic purity till almost the end of March did not compete favourably with Co. 313 in South Bihar. Notwithstanding the extremely mild hot weather the irrigation trials both at Musheri and Patna showed results significantly in favour of summer irrigation and on account of the consistent results obtained over the last three seasons, the hot weather irrigation of cane can now be definitely recommended.

The manurial trials at the sub-station at Patna were largely vitiated by floods and the results obtained were inconclusive. It was observed both at Musheri and Patna that the application of a second dose of manure at earthing time invariably caused a temporary slowing down of growth.

Interculture trials indicated beneficial results both from intercultivation and hand weeding, the latter showing slightly higher cane yields due in past to the small damage to the surface roots.

To place varietal work on a sounder footing and to secure the co-operation of growers and millers in releasing new varieties of sugarcane to the industry in Bihar, the Government of Bihar have recently appointed a Sugarcane Advisory Committee consisting of official members and representatives of the millers and the growers. The plantation estates have agreed to place at the disposal of the Department such areas as the Department may require for the quick testing of new promising varieties under local conditions so that the varietal work that has so far been restricted to the Government farms will be extended and speeded up. Another very big advantage of this early release of promising varieties is that mill tests can be arranged at different centres within the second year of such release as plantation estates are usually within easy reach of the mills. Similarly, work on manuring is being extended to number of selected factory estates. In factory estates areas will be set aside for the establishment of seed nurseries to disseminate healthy stocks among growers.

The Sugar Committee noted these arrangements with approval.

Manufacture of Khandsari Sugar by the open single pan method at Patna.—A research scheme for the manufacture of Khandsari sugar has been in operation at the Patna Government Agricultural farm for the last three seasons and is now being closed down. The main objects of the schemes were:—

1. Devising and testing improvements and modifications in the present S. B. furnace.
2. Testing different modifications of the S. B. pans.
3. Investigation into the technique of *rab* making.

As usual, Co. 213 formed the basis of the experiment except for a few trials with Co. 331, towards the close of the season.

The following are the summarised recommendations:—

A simple single pan furnace, known as S. B. furnace, has been devised. It is easy to make, is cheap and simple in working and has proved very efficient, taking 45—55 minutes only for boiling 1½ maunds of juice to the stage of *rab*.

Single superphosphate and *bhindi* mucilage combination proved to be the best clarifying medium. Less than ¼ lb. of each is required per charge, and the clarification is quick and thorough.

It has been established that *rab* with a brix value of 85—87 was the best for the production of Khandsari sugar. In order to obtain an approximately uniform product and to standardise conditions, a small float, on the principal of hydrometer, has been devised and has been named the "Rabometer". The striking point of the *rab* is quickly determined by dipping this float in a small quantity of *rab*. The rabometer costs only three annas and is simple enough to be used by any cultivator.

The only way to limit inversion was to reduce the time of boiling juice for the preparation of *rab*. This was achieved by increasing the efficiency of the furnace. Reduction in the amount of juice per charge

reduced the time of boiling but this proved uneconomical. The clarifying agents had no effect on inversion.

A small quantity of hydros or sodium bisulphate, sprinkled on the bottom of the cooling vessel, considerably helps to clarify *rab* and proved to be of value in obtaining better quality of sugar.

The optimum period for maturing *rab* before centrifuging has been found to be seven to ten days. During this period, the *rab* should be periodically stirred.

The percentage of sugar on cane varied from 5-6, depending upon the quality of juice and the season.

Waste molasses from the centrifuge was boiled to prepare *gur*. In the process of *gur* making, it was found that a small amount of crushed Khandsari sugar, if poured in the pan, after it has been taken off the furnace, considerably helps to give crystalline texture to the *gur*. In this way marketable quality of *gur* is obtained from the molasses. The yield of this *gur* on cane was 4-5 per cent.

Sugarcane research at the Jorhat Experimental farm (Assam).—The work during the year consisted of studies of new Coimbatore canes both in nursery and observation plots including periodical analysis of juice of selected varieties and varietal, manurial and cultural experiments.

Some of the new Coimbatore varieties have been gradually found to be highly promising and distinctly superior to the standard cane of the farm P. O. J. 2714. Definite mention was made of the outstanding outturn of Co. 419 last year, followed by such other varieties as Co. 864, Co. 408, Co. 411, Co. 412 and Co. 413, each giving over 40 tons stripped cane per acre. All these varieties have maintained their reputation. This year, the variety Co. 421 has been as promising as Co. 419 giving an outturn of more than 50 tons cane per acre. The two varieties Co. 407 and Co. 410 have also done quite well this year giving about 40 tons cane per acre. Co. 417 was not very hopeful either as plant or ratoon. The sugarcane sorghum crosses appeared to be more hopeful this year regarding yield of cane but they all ripened normally offering no distinct advantage over other new Coimbatore varieties, so far as early maturity was concerned. The new varieties, Co. 409 and Co. 360 tried for the first time under field conditions this year did not appear to be promising.

Breeding of thick canes, Mysore.—This is the fourth year of the scheme. As in previous years the work was conducted at the Hebbal Farm, Bangalore, the Irwin Canal Farm, Mandya and the Central Laboratories, Bangalore.

Varietal tests on exotic and indigenous varieties were continued. There were forty exotic varieties and one hundred and twenty-seven indigenous ones. Seasonal plantings were continued during the year. Studies of the incidence of borer attack, flowering of canes and maturity studies were continued.

Borer attack has been considerably kept down, by earthing up, by ploughing in sann hemp grown in the rows in the rattoon plots and by liberating the *Trichogramma* parasite. The setts are also soaked in cold water for twenty-four hours prior to planting, thereby killing any insect that has been left over in the setts. It looks as though that the borer has now ceased to be a major pest in the canal area.

Sugarcane "Mosaic" is also causing less anxiety now as new canes are being evolved which are resistant to the disease. Selection of healthy setts for planting has eleminated mosaic in most of the plots.

During the year under report a large collection of arrows from different varieties was made. Seedlings raised from these have already been transplanted at Hebbal. The most important ones are from P. O. J. 2878, P. O. J. 2725 and sugarcane sorghum hybrids from Coimbatore.

The effect of X-rays in inducing variations is being investigated.

Sugarcane setts were also distributed to places outside the State. H. M. 320 still continues to be popular in Mysore and is the principal cane for the Sugar Factory at Mandya. A number of new Mysore seedlings are now being tried in Natal, Formosa and the United States of America.

Research on Mosaic and other diseases of sugarcane.—Owing to the shift of the Institute to Delhi it was not until the end of November that sufficient facilities were available to resume normal scientific activities.

At the request of the Economic Botanist (Sugarcane and Paddy) to U. P. Government a tonnage experiment with Co. 313 has been started at Sugarcane Research Station, Shahjahanpur. This experiment will also elucidate the important point of natural transmission of sugarcane mosaic under Shahjahanpur conditions.

After repeated experiments the thermal-death-point of virus from Co. 313 has been found to be between 50°—55° C. That of virus from Co. 215 has already been determined and reported to be about 45°C and that of M-16 about 65°C. The fact that there are such vast differences in the thermal-death-point of the mosaic from leaf juices of different cane varieties strongly suggests the existence of at least three distinct strains of sugarcane mosaic virus.

Virus trials of storing the mosaic leaf juice at different temperature for varying periods and then inoculating into cane plants to test infectivity confirmed the tentative conclusion at, that temperature is the most important factor in storage life of mosaic virus: the lower the storage temperature the longer the period the mosaic leaf juice can retain its infectivity and *vice versa*. Co. 313 mosaic leaf juice stored at 6°C was found to be infective even after 96 hours' storage.

Twenty-two cane varieties recommended as important by the Government Sugarcane Expert, Coimbatore, have been tested for their relative resistance or susceptibility to mosaic. These have been artificially inoculated with Co. 313 mosaic leaf juice. Cos. 213, 223, 299, 312, 313, 331, 362, 402, 412, 413 and 419 appear to be comparatively more susceptible to mosaic.

Sugarcane Sub-station, Karnal.—The area was extended from thirty to fifty acres and the scientific staff strengthened by the addition of a Technical Assistant.

Growth conditions during the year were favourable—a mild summer, no frost, and no major pests and diseases on a large scale.

The trials have brought out Co. 421 as the most outstanding in performance with a second line of useful types in Co. 313, Co. 312, Co. 331 and Co. 341. As is seen from the *gur* figures a material advance has been made on Co. 285, the present standard cane of the tract.

One or two 'early' canes have been revealed by the tests, but they need further watching. It is satisfactory that both Co. 285 and Co. 421 were free from smut. The appearance of smut in popular canes like Co. 313 and Co. 331 and to a lesser extent in Co. 213 and Co. 312 indicate that they need watching for this disease.

Scheme for investigating suitable types of canes for Gujarat.—A five years' scheme for testing suitable types of canes for Gujarat, involving a grant of Rs. 20,000 was submitted by the Government of Baroda in 1933. The scheme was revised by the Sugar Committee, which reduced the cost to 11,300. The Advisory Board in its meeting held in July 1935, adopted the recommendations of the Sugar Committee and recommended the scheme as modified by the Committee for sanction of the Governing Body.

The object of the scheme is to carry out a systematic study of various types of canes received from Coimbatore and elsewhere and to select the most suitable ones for Baroda and Gujarat. The grant is asked only for the expert staff to be attached to the new sugarcane farm at Vyara. Other expenses regarding cultivation, etc., being met by the Baroda Government. The work will be carried out by the officer-in-charge of the farm under the supervision of the Director of Agriculture.

The scheme was started in November 1936.

The technical programme of work was received and approved.

(vi) *Report of the Sugarcane Geneticist.*—In the economic programme of breeding improved sugarcanes parents with rather a complex make-up have often to be employed. As such parents and their hybrids are not the most suitable for genetical work, the first two years were devoted to the breeding of comparatively simple hybrids. It was possible during the third (current) year to take up the genetical and cytological analysis of the genus *Saccharum* with the idea of ultimately bringing sugarcane breeding in line with that of other crop plants.

The more important of the findings during the year are mentioned below :—

(1) There is evidence of polyploid inheritance in certain interspecific *Saccharum* hybrids.

(2) Certain of the hybrid population and selfed seedlings of *Saccharum spontaneum* showed giant forms which are suspected to be triploids.

(3) Presence of the fourth glume in a sugarcane would appear to be indicative of the same having *S. spontaneum* blood in it.

(4) It was found possible to build up, through suitable cross-breeding, certain of the *S. spontaneum* types occurring in nature.

(5) When the cane Vellai is crossed with other species of *Saccharum* or other genera, doubling of chromsomes takes place in certain cases but not in others. This would appear to be traceable to the presence of binucleate gametes in Vellai.

(6) The collection of wild *Saccharums* at the Station was materially added to during the year.

(vii) *Research on the chemistry of the Sugarcane.*—The object of the investigation is to study the chemical composition of sugarcane and its

juice with reference to variety, soil conditions, fertiliser treatment and climate.

When the scheme was originally submitted in 1932 it was for a period of five years and included a detailed study of the formation and movement of carbohydrates in the cane and the effect of the elements N, K, P, Ca and Mg on the same. Since then, the period of the scheme has been reduced to three years and a scheme for the study of the physiology of sugarcane at Benares has been sanctioned. The Benares scheme provides for the study of the formation and movement of carbohydrates and the effect of the more important elements of nutrition on the same. These will not therefore be investigated at Delhi and the scope of enquiry will be limited to the more practical aspects of the problem in the following directions using two or three distinctly different varieties wherever possible or necessary:—

1. A study of the existing methods of analysis for the determination of the different constituents in the cane and in the juice and devising suitable methods.
2. The proximate and ultimate composition of one or more standard varieties of cane bred at Coimbatore and cultivated in the different parts of the country under varying conditions of soil treatment and climate.
3. Composition of sorghum-hybrids and their juices.
4. Whether the superiority of a high yielding variety is due primarily to the greater utilisation of reserve nutrients in the soil or to its inherent better synthetic activity.
5. The extent of chemical precipitation and colloidal flocculation of juices on heating and liming.
6. The optimum flocculation point with reference to iso-electric point.
7. Degree of purification of juice by charcoal treatment and other methods from qualitative and quantitative points of view.
8. Conditions, if any, leading to the reversibility of flocculation.
9. The factors leading to the development of colour on concentrating clarified and purified juices.
10. The nature and properties of non-sugars in the cane and in the juice.

The immediate programme of work will be the investigation of the most suitable methods for the determination of the several constituents in the cane and in the juice. The other items of the programme will be taken up according to convenience. The work will be carried out in co-operation with the Imperial Sugarcane Expert.

During the year the technical programme of work on the scheme was received and approved. The scheme was started in May 1937.

(viii) *Research on the morphology and anatomy of sugarcane, sorghum hybrids, and wild Saccharums.*—This scheme was approved by the Sugar Committee in 1933 and the Governing Body in 1935 and a small grant

spread over three years, was sanctioned for research on developmental morphology and anatomy at the University of Madras under the direction of Prof. T. Ekambram.

Because of the importance of the fibre content of sugarcane to the manufacturer and of standing power to the cultivator, it is of considerable interest to know more of the inheritance of anatomical characters both in sugarcane and in the sugarcane-sorghum hybrids.

The programme includes:—

(1) a study of the development of the tissues of seedlings of sugarcane, wild *Saccharums*, and sorghum hybrids;

(2) a study of their adult anatomy with a view to gaining knowledge of the inheritance of anatomical characters.

The scheme was started in March 1937; a technical programme of work was received and approved.

22. *Imperial Institute of Sugar Technology.* (i) *Industrial and Technical.*—Out of a total of 150 cane factories in India, 140 factories worked during the season 1936-37 as against 137 factories in the previous year. Nine factories did not work during the season and one has been excluded as it is a small experimental factory for training of students, with a nominal and uncertain output. 145 cane factories are expected to work during the season 1937-38 out of a total of 154 factories in India, 9 factories are expected to refine *gur* during the year 1937 as against 13 in 1936.

The position of the sugar industry in India on its technical side is shown by an analysis of the average percentage recovery of sugar from cane for factories in different Provinces of India during the season 1936-37 compared with that of the previous season.

Average percentage recovery of sugar from cane during the season 1936-37.

	Average Percentage Recovery of Sugar from cane.							
	36-37				1935-36.			
	United Provinces.	Bihar.	All other Provinces.	All India.	United Provinces.	Bihar.	All other Provinces.	All India.
Maximum .	10·49	10·55	11·43	11·43	10·60	10·06	11·34	11·34
Minimum .	8·36	8·52	6·06	6·06	7·45	6·60	6·59	6·59
Mean . .	9·65	9·20	9·60	9·50	9·60	8·93	9·00	9·29

The highest recovery for the season was 11·43 per cent as against 11·34 per cent during this preceding season. The average extraction for Bihar as well as for the whole of India shows a substantial increase, the figures being 9·20 and 9·50 for 1936-37 as against 8·93 and 9·29 for 1935-36.

The work under Sugar Production Rules, 1935, was continued as usual with some important additions and charges. Forms relating to schedule of machinery were added to the existing forms. Consolidated statements of (i) Monthly manufacturing data, (ii) total price paid for cane and the net price actually received by the grower (monthly) and (iii) Sugar Production and Stocks (fortnightly) in respect of Central Sugar Factories were compiled, cyclostyled and distributed regularly. With a view to secure wider publicity short summaries in English, Hindi and Urdu of the various Consolidated Statements, Memoranda and Notes of general public importance were compiled and published in Indian Newspapers through the Director of Public Information. Previously copies of these publications were supplied to the co-operating sugar factories, Directors of Industries to all Provincial Governments and the representative Sugar Organisations. Since the beginning of the cane crushing season of 1937-38 copies of these publications are also being supplied regularly to the Cane Commissioners and Collectors of important sugarcane growing divisions and districts in India and Burma, Secretaries to all Provincial Governments and important foreign journals.

The pamphlet entitled "Sugar Production Rules, 1935" with explanatory Notes" was revised for printing. It has been decided to compile Technical Bulletins for Central Sugar Factories and Refineries and annual statements showing analysis of the cost of production of sugar and to supply the printed copies thereof to the co-operating sugar factories, representative Sugar Organisations and Provincial Governments.

A technical survey of the *gur* industry in India is being undertaken with special reference to *gur* making outfits and the improvements made therein and it is hoped that a complete monograph in this connection will be published for the benefit of the Industry. A note on the utilisation of molasses as a road making material was also published in the *Indian Trade Journal* and its reprints distributed to all concerned.

There was a heavy demand of the services of the Director and other technical staff of the Institute for giving technical advice to the factories, Provincial Governments and Indian States. The following table shows the varied nature of activities in this connection:—

1. Technical advice dealing with erection, starting up, extension including factory run reports scrutinized.	47
2. Number of factories advised during operation regarding efficiency of working.	135
3. Number of replies to general technical enquiries . .	650
4. Number of sugar factories helped in recruiting their technical staff.	40

(ii) *Research and Experiments.*—The following experimental and research work is in progress in the Institute:—

(*a*) Treatment of sugar factory effluents.

(*b*) Experiments on cane dryage.

(*c*) Manufacture of an insoluble road composition.

(*d*) Recovery of sugar from molasses by biochemical methods etc.

(*e*) Experiments on the keeping quality of sugars.

(*f*) Optimum and minimum pH of juice for clarification.

(*g*) Dry liming and the use of milk of lime for clarification.

(*h*) Studies in Butyl alcohol fermentation.

In addition to the above the following experimental and research work was also commenced and is in progress:—

(*a*) Working out a formula to compare different kinds of cane based on an easy analysis.

(*b*) Experiments on rapid and slow cooling in crystallisers.

(*c*) Experiments on different methods of graining in boiling pans.

(*d*) Systematic analysis in connection with the maturity of sugar-cane varieties grown in the Government Farm, Cawnpore.

(*e*) Preparation of activated carbons for use in sugar and *gur* industry from cheap raw material and from agricultural waste products.

(*f*) Clarification of sugar syrups for use in the manufacture of "Syrup Simplex" and others used in the manufacture of aerated waters.

(*g*) Evolving a new method for a more perfect clarification of sugar juices.

(*h*) Investigation on the possibility of the separation of sugars by their differential solubility.

(*i*) Study of the action of potassium, sodium and calcium hydroxides and alkaline carbonates on sucrose, glucose and fructose in aqueous solutions at different temperatures (between 50° to 100°) and in different concentrations (0·5 to 5 per cent).

(*j*) Rapid conversion of molasses into manure.

(*k*) Manufacture of yeast.

(*l*) Manufacture of acetic acid from molasses.

(*m*) Manufacture of edible molasses.

(*n*) Cropping experiments with manures made from molasses and filter press cake.

(*o*) Method of specifying for grain of sugar.

(*p*) Relationship between crushing capacity and manufacturing overhead expenses.

(*q*) Construction of control charts for daily analysis of cane, juice, syrup, molasses and sugar produced in factory.

(*r*) Experiments on boiler working and its efficiency with coal and bagasse fuel with a view to find out heat economy in sugar factory.

(*s*) Investigation on power required per ton of cane crushed and efficiency of extraction with different kinds of cane, charge of feed and speed.

(iii) *Research and Testing Station for the indigenous system of* gur *and sugar manufacture.*—During the year under report testing and research work continued as usual. Particulars of work done are given below:—

(*a*) The following machinery was tested:—

(A) Power Crushers:—

(1) Shishiar (made by Kirloskar Brothers).

(2) Vasant (made by Kirloskar Brothers).

(3) Phoenix (made by Jessop & Co.)

(4) I. C. A. R. No. II (manufactured at Cawnpore).

(5) I. C. A. R. No. II (manufactured by Kirloskar Brothers).

(B) Bullock driven crushers:—

(1) Karamat (Kirloskar Brothers).
(2) Kumar (Kirloskar Brothers).
(3) Collectory 9″ × 9″ (Chhuttanlal Mattumal, Delhi).
(4) Langardar 9″ × 9″ (Chhuttanlal Mattumal, Delhi).
(5) Collectory 8″ × 8″ (Chhuttanlal Mattumal, Delhi).
(6) Collectory 9″ × 9″ (Malloomal Ramprashad, Agra).
(7) Patna type (Bhanamal Gulzarimal, Delhi).
(8) Delhi type 8″ × 10″ (Bhanamal Gulzarimal, Delhi).
(9) Delhi type 8″ × 11″ (Bhanamal Gulzarimal, Delhi).
(10) Crusher of Duncan Stratton & Co., Bombay.
(11) Collectory No. 1, 7″ × 7½″ (Delhi Iron Syndicate).
(12) Collectory No. 2, 8″ × 8″ (Delhi Iron Syndicate).
(13) Collectory No. 3, 9″ × 9″ (Delhi Iron Syndicate).
(14) Crusher No. 1, 9″ × 8″ (Receiver perfect & Co., Lucknow).
(15) Crusher No. 2, 8″ × 8″ (Receiver perfect & Co., Lucknow).
(16) Crusher of Oudh Engineering Works, Hardoi.
(17) Crusher of Madan Lal Raghunath Pd., Bareilly.

(C) Bels:—

(1) Improved Rohilkhand Bel.
(2) Rohilkhand Bel.
(3) Poona Triple Furnace.
(4) Delhi Furnace.
(5) Jullundur Single Pan Furnace.
(6) South Bihar Single Pan Furnace.
(7) Toofan Single Pan Furnace without gratings.
(8) Toofan Single Pan Furnace with gratings.
(9) Prabhakar Single Pan Furnace.

(10) Desi Single Pan Furnace with gratings.

(11) Desi Single Pan Furnace without gratings.

(12) Desi Single Pan Furnace with gratings and baffle wall.

(13) Gaza Single Pan Furnace.

(14) Paddy Husk Cartonising Furnace.

(D) Centrifugals:—

(1) Centrifugal of Kirloskar Brothers.

(2) Centrifugal of Bery & Co.

(*b*) The following research work was also undertaken at the station:—

(1) Manufacture of candy from low grade Khandsari sugar.

(2) Keeping quality of syrup from neutralised juice by lime water to pH of 6·0, 6·2, 6·4, 6·6, 6·8, 7·0 and blank.

(3) Manufacture of activated carbon from paddy husk and bagasse screens.

(4) Determination of the efficiency of the hand and power driven crystalliser.

(5) Comparative study of storing *rab* in different containers.

(6) Neutralisation of juice by means of lime water and calcium sucrate to difference pH and manufacture of *gur* therefrom for refining purposes.

(7) Reduction of moisture in *gur* to improve its keeping quality by addition of sugar.

(8) Experiments on surface infection of *gur*.

(9) Determination of the "Soda-blankit" mixture ratio to improve the colour of *gur*.

(10) Determination of the ratio of hygroscopicity of *gur* to the surface exposed and derivation of safety factor.

(*c*) Training was also imparted at the station during the year under report, particulars of which are given below:—

43 juice-boilers for the United Provinces Government's *gur* scheme belonging to the districts of Lucknow, Shahjahanpur, Bareilly and Badaun were trained for about a month and a half both theoretically and practically in the improved methods of *gur* boiling, construction and working of improved types of furnaces and use of chemicals, etc., for clarifying and bleaching. Training was also imparted to 22 farm Superintendents, Agricultural Inspectors and Fieldmen of the United Provinces Agricultural Department in the manufacture of activated carbon and cream jaggery. In addition to the above, 4 men from the United Provinces Co-operative Department were trained in the working and construction of bigger furnaces for making *rab* and in improved methods of *gur* boiling in single pan furnaces.

(iv) *Bureau of Sugar Standards.*—During the year under report the "Review of the quality of sugar manufactured in India by Central Sugar

Factories and Refineries during 1936-37" was compiled and published in the *Indian Trade Journal* of May 13th, 1937. Reprints of this were sent to all concerned. The Indian Sugar Standard grades for the year 1937-38 were prepared according to the previous year's specification except for a minor change. In all 72 sets were sold as compared with the same number during last year. Out of these, the number of fresh sets sold is 32 and that of old sets refilled is 40. In addition to the above 72 standard sets, 5 standard grade bottles and 7¼ dozen empty bottles were also sold. Circulars were also issued from time to time to the industry and trade explaining the necessity for and the uses of the standard sets.

The pamphlet on "The Indian Sugar Standards" first published in 1935 was revised incorporating all the changes and recommendations since effected. Printed copies of the same were also widely circulated. A note on "The Fixation of an Average Standard Quality of 1st Sugar for the Cawnpore Terminal Market" was prepared on the basis of analysis of a large number of samples collected from the local market and supplied to the Cawnpore Sugar Merchants Association and to the Agricultural Marketing Adviser to the Government of India.

Samples of sugar were obtained for the Museum of the Imperial Institute of Sugar Technology from different sugar factories in India. Reports on the quality of each sample received were supplied to the factories concerned. Samples of *gur*, *rab* and palm jaggery were also obtained from different agricultural farms and markets in India and were exhibited in the Museum.

Arrangements are now in progress for the preparation of standard sets for the next season and for compiling the review of quality of sugar made in India during the season 1937-38.

(v) *Cattle Feed Experiments.*—Experiments on the manufacture of cattle-feed from molasses and bagasse, which were started in November 1935, were continued with a grant from the Imperial Council of Agricultural Research during the year under report. Samples of feed prepared were supplied to, and prolonged feeding tests are being carried out at the following animal nutrition centres.

1. Allahabad Agricultural Institute, Naini, United Provinces.

2. Agricultural Chemist to the Government of Punjab, Lyallpur, Punjab.

3 Imperial Dairy Department, Bangalore.

4. Government Cattle Farm, Patna, Bihar.

5. Government Cattle Farm, Madhuri Khurd, Muttra, United Provinces.

6. Government Cattle Farm, Bahran, Jhansi, United Provinces.

7. Imperial Veterinary Research Institute, Mukteswar.

8. R. E. I. Dairy, Dayalbagh, United Provinces.

9. Agriculture Sub-station, Imperial Cattle Breeding Farm, Karnal.

Interim reports from four centres and final report from one centre have been received of the feeding trials that are being conducted.

The following work under this scheme has also been carried out during the year under report :—

1. Designing of rotating type of screener. Effect of screens of different meshes have also been studied.

2. Designing of combined drier and mixer.

3. Study of the keeping qualities of feed.

Preparation of cattle feeds from only bagasse screenings and molasses is in progress and it is intended to despatch these feeds to the animal nutrition centres for conducting feeding trials. The necessary quantity of proteid materials to make up the balanced ration will have to be added at the centres according to the necessity and liking of the cattle. The economic value of the feeds and what common fodders these feeds can replace will thus be studied.

A report for the extension of this research scheme for a further period of 3 years has been submitted to the Imperial Council of Agricultural Research for sanction, in order to make a detailed study of the true feeding value of the cattle feed prepared from molasses and bagasse, the by-products of the Sugar Industry.

(vi) *Statistical.*—Statistical work in the Institute on sugar production and trade continued. Arrangements were made during the year under report for collection of excise returns from district officers of the United Provinces and Bihar. As in previous years notes embodying information of use to the Sugar Industry in India were supplied to the Director General Commercial Intelligence and Statistics, Calcutta, for publication in the *Indian Trade Journal.* Brief reviews of the cane crop conditions in different parts of the world were compiled for incorporation in the All-India Sugarcane forecasts published by the Director General, Commercial Intelligence and Statistics, Calcutta. Periodical reports such as forecasts and notes on the production of sugar in India directly from cane as well as refined from *gur* were prepared and published in the *Indian Trade Journal.* The subject matter of the Review of the Sugar Industry of India was rearranged and its scope enlarged by the addition of various data such as (1) consumption of sugar in the provinces, (2) *per-capita* consumption in principal sugar producing countries, (3) movement of prices of sugar in the world markets, tariffs, etc. The Annual Review of the Sugar Industry of India for the year 1936-37 was compiled for publication in the *Indian Trade Journal.*

The Director General, Commercial Intelligence and Statistics, Calcutta, was furnished with brief notes on monthly exports of sugar from Java which were regularly published in the *Indian Trade Journal.* He was also supplied with weekly quotations for refined and edible *gur* in important markets by telegrams. Figures for stocks of sugar at the major Indian ports together with the first cost quotations for Java white sugar and the price quotations for typical Indian Factory Sugars in the Cawnpore Sugar Market were also sent to him every week. Various other statistics such as those relating to quantity and price of molasses sold by sugar factories to the Indian Molasses Company, Calcutta, railway freight on sugar from factories to different marketing centres, cost of production of sugarcane in the provinces, cost of production of sugar in foreign countries, etc., were also collected and utilized during the year under report.

The Sugar Cable Service and the Sugar Postal Service continued to obtain and distribute to members early and reliable crop and market reports regarding sugar in the principal countries of the world. The Indian Sugar Trade Information Service continued to collect and distribute among its subscribers daily quotations and weekly reports for sugar from competent Indian Sugar Markets.

(vii) *Training in Sugar Technology.*—Since the amalgamation of the Sugar Section of the Harcourt Butler Technological Institute and the Office of the Sugar Technologist, Imperial Council of Agricultural Research, and their development into the Imperial Institute of Sugar Technology, the previous courses in Sugar Technology have undergone a complete change. Short courses covering the different technical sides of the Sugar Industry have also been started in order to provide facilities for those already engaged in the industry. The duration of some of the courses have been extended in order to impart training of a higher standard in Sugar Technology.

The number of admissions made in 1937-38 to the different courses was as follows:—

Fellowship Course	3
Associateship in Sugar Technology	11
Sugar Boiler Course	4
Short courses in Chemical Control	3
Pan Boiling	5
Dutch Language	1
Total	27

Out of the total number of students admitted in 1937-38, fourteen came from the United Provinces, three each from Bombay and Bihar, two each from Bengal, Punjab and Delhi and one from an Indian State.

There was the usual rush for information regarding facilities for training in Sugar Technology in India and abroad. Consequently a prospectus was printed in this connection and sent to those requiring such information.

During the period 1931 to 1937 total number of students trained in the old sugar courses of the Harcourt Butler Technological Institute was 207, out of which 107 passed in the Sugar Diploma Course, 33 in the Sugar Analyst Course, 66 in Sugar Boiler Course and 1 in Khandsari foreman course. Over 85 per cent. of the students secured employment in sugar factories.

(viii) *Employment Bureau.*—The activities of the Employment Bureau were reorganised and new rules were drawn up. A nominal fee of Re. 1 per candidate is charged from the persons registering their names in the Bureau which, as usual, assisted to a great extent in finding jobs for technically qualified persons in sugar factories.

(ix) *Publications and Library.*—75 notes giving detailed statistical information were published in the *Indian Trade Journal.* The Institute Library was freely used by persons interested in Sugar Industry. 363 publications were added to the library and 18 new periodicals were subscribed during the year under report.

23. (i) *Research on Sunn-hemp in Madras, Bombay, Bihar and the Central Provinces.*—The general programme of work for these four schemes has been mentioned in the previous report. The schemes were all started in 1937 excepting that in Bihar which commenced work only early in January 1938. During the year under report, technical programmes of work were received from Madras and Bombay and were approved.

(ii) *Investigation into methods of extraction of flax fibre.*—Preliminary experiments on extraction of flax fibre having proved successful, it was thought desirable to try out the method thoroughly and to find out whether this industry could be established in this country. The grant began from the year 1936-37.

A new pedigree seed namely Liral Monarch was imported from Ireland for trial during the years 1934-35 and 1935-36. This was grown during these two years in different parts of India to find out the most suitable tract as well as the best condition for its growth. Seeds obtained from all these places were used for the experiments conducted during the year 1936-37. At Karnal, flax was grown at the botanical sub-station and at Shillong this was grown at the Government Farm. An acclimatised variety of flax seed namely J. W. S. originally brought from Ireland and acclimatised for over eight years in India was also included in the experiment. This acclimatised seed was obtained from the Imperial Economic Botanist. A variety of flax seed namely 'Oil Flax' was obtained through the Indian Government Trade Commissioner at Hamburg. This variety is said to be high-yielding as regards both fibre and seed, and was tried to find out its suitability in this country. A few other varieties were also included.

Flax was grown at Dacca, Rangpur, Berhampore and Dinajpur Farms, as well as on private land in a deep water paddy tract during the year under report.

All the produce was brought to Dacca for retting and extraction. The scutching apparatus has been devised and made at Dacca. Three designs have been made and are being thoroughly tested. Arrangement has been made this year to grow the crop in cultivators' own land in two different places in Bengal, namely, one at Rangpur and another in Char-land in Faridpur district. Machines for extraction of the fibre will be taken to those places and the method demonstrated.

Seed multiplication.—As the results of flax experiments have been found promising the question of seed production for its future expansion has become imperative. The Imperial Agriculturist has kindly agreed to grow this at the Cattle Farm at Karnal.

24. *Tobacco.*—(i) *Co-operative scheme of flue-curing experiments.*—In 1934 the Tobacco Sub-Committee of the Advisory Board of the Imperial Council of Agricultural Research recommended that two standard imported varieties of cigarette tobacco, Adcock and Harrison's Special, be grown under a variety of conditions to determine the most suitable areas for growing cigarette tobacco in India. The Imperial Council of Agricultural Research agreed to provide funds for the construction of flue-curing barns in the Provinces concerned and it was also agreed that pure seeds of the varieties should be issued by the Imperial Agricultural Research Institute.

The scheme came into operation in 1935 when seeds of Adcock, Harrison's Special, and Pusa H. 142 were supplied to the co-operating Provinces. The third variety, Pusa H. 142, was included at the suggestion of the Imperial Economic Botanist who considered it to be a particularly promising variety. The task of co-ordinating the work under the scheme having been entrusted to the Imperial Agricultural Research Institute, the Imperial Economic Botanist sent a circular letter to the officers concerned, giving instructions for sending samples of cured leaf for evaluation. He also arranged to obtain the assistance of the Indian Leaf Tobacco Development Company in appraising the samples.

Most of the Provinces, however, appear to have had difficulty in constructing their flue-curing barns in time with the result that only a few samples of cured leaf were received by the Imperial Economic Botanist, and in some cases, the samples sent were sun-cured instead of being flue-cured. In view of this it was not possible to draw any definite conclusions from the results of this crop-year.

(ii) *Research on cigarette tobacco.*—The activities of the scheme are (1) manurial experiments to test the effect of different manures on the cured leaf, (2) curing experiments to test the value of the leaf produced under different manurial and cultural treatments, (3) chemical analysis of leaf at different stages of curing and aging to discover whether the problem of flavour can be correlated with any chemical difference which, in its turn, may be dependent on cultural methods or dependent on some intrinsic varietal property, (4) breeding of new types (after sufficient progress has been made in the above three items), (5) study of the leaf-curl disease of tobacco. Owing to the scheme coming into operation rather late in the year it was not possible to commence work on all the items, and the work done at the sub-station during the year was mostly of a preliminary nature except in the case of item (5) in which advantage was taken of experiments previously carried out at Pusa and considerable progress made.

While approving the two reports mentioned above, the Advisory Board made the following observations:—

(i) The Committee stressed the necessity for as much uniformity as possible in the flue-curing experiments, in the form and details of the presentation of the results, and in the weights and measures used.

(ii) The Committee recommended that in view of the necessity of ensuring an indigenous and independent supply of acclimatised tobacco seed for cigarette tobacco steps should be taken at once to arrange for the same in suitable areas and with suitable organisation.

(iii) The question of building cheap flue-curing barns should be investigated in the Guntur District.

25. *Enquiry into the possibility of clove production in India.*—Imports of cloves mainly from Zanzibar are valued at over 30 to 40 lakhs annually. The question whether clove could be profitably produced in India has been raised from time to time but there was a lack of precise information. At the instance of the Central Government the Imperial Council of Agricultural Research undertook to make an enquiry.

With effect from 15th May 1937 the Imperial Council of Agricultural Research appointed Dr. A. K. Yagna Narayan Iyer, retired Director of Agriculture, Mysore, as officer on special duty to make the enquiry in promising areas in South India. The enquiry lasted for about six months. He visited parts of Coorg and Mysore as well as the Nilgiris and Tinnevelly and has submitted a report which has recently been published as miscellaneous bulletin No. 20 of the Imperial Council of Agricultural Research.

This report records the Special Officer's observations on the scattered clove cultivation now existing in India, deals with the soil and climatic conditions necessary for clove plantations and makes suggestions for the future.

26. *Scheme for research in Agricultural Economics by the Director, Gokhale Institute of Politics and Economics, Poona, Bombay.*—This is a small study in methodology. The results of the survey method which is to be tried under the auspices of the Institute should be of general application. The Institute contributes half the cost of the scheme, the other half being provided by the Imperial Council of Agricultural Research. The scheme started on the 1st February 1937 to run for a period of two years. The first progress report on the scheme has not yet been received.

27. *Mysore scheme of insecticidal value of plant fish poisons and other forest products.*—Work already in progress during the last three years is given below in brief:—

I. *Entomological.*—About 40 plants available locally have so far been tested. Of these over a dozen plants and their parts have been found to have some toxic value against various insects, and three plants are being studied in detail.

It has been difficult to find a uniform kind of insect throughout the year for laboratory tests. Attempts were made to rear some caterpillars in the insectary. After about 4-5 generations they died out. Thus it is possible to test the various plant products on available insects only during particular seasons of the year when they are found in numbers.

The method followed so far for laboratory tests has been to spray the extracts at different strengths—against a known number of insects on the host plant by a De Vilbiss Atomizer No. 15. It has been calculated from repeated experiments that 0·5 c. c. of the extract is sprayed per stroke of the atomizer from the distance of a foot. The number of strokes varied from 4 to 8 according to the size and age of insects.

Derris elliptica cuttings imported from the Federated Malay States and planted about 3 years ago are growing very luxuriantly. Plant cuttings have been distributed widely in the Mysore State and the plants are growing very well. The roots of the plants grown here, when analysed, showed the presence of about 7 per cent. rotenons. In small-scale insecticidal tests with water and alcoholic extracts, the roots were found to have very good toxic action.

II. *Chemical.*—Several plant substances—nearly 40 in number—reputed to possess insecticidal activity and selected by the Entomologist for one reason or other, were examined in detail and the part or parts of a plant possessing highest insecticidal activity defined, *e.g.*, root and stem bark of *Mundulea suberosa*, seeds of *Tephrosia candida*, fruit of *Randia dumetorum*, etc. A chemical assay for total extractives and their relation

to known insecticides was also conducted. The keeping qualities of these extracts were studied in detail. A detailed chemical fractionation of two of the most promising of these 40 plant substances was undertaken.

A study of solvents for maximal extraction of active principles consistent with as low a cost as possible was conducted and selection of suitable solvents made. A crystalline active substance possessing all the activity and weighing as much as 3-5 per cent. of the original substance has been obtained from *Mundulea suberosa*. Ultimate analysis and certain chemical reactions of the product seem to indicate that the product is related to Tephrosin. Possibilities of its large scale preparation are being explored.

Two resinous solids possessing considerable activity have been obtained from seeds of *Tephrosia candida* and are being chemically analysed.

The scheme has been extended upto the end of September 1938 to enable the Mysore Government and the Forest Research Institute, Dehra Dun to put before the next meeting of the Advisory Board, a scheme of work to be worked jointly by the two authorities.

28. *Crops and Soils Wing, 1937.*—The second meeting of the Crops and Soils Wing of the Board of Agriculture and Animal Husbandry was held from 6th to 9th December 1937 at Lahore and was followed by a visit to Lyallpur to see the research work in progress at the Punjab Agricultural College and its surrounding farms. On the first day His Excellency the Governor of the Punjab was pleased to open the deliberations of the Board. The Director of Agriculture, Punjab, made all the local arrangements in Lahore and Lyallpur. About *60* members were present and the Vice-Chairman of the Council and later the Agricultural Expert presided over the meetings.

The agenda of the Board was as follows:—

I. A review of soil survey work in India upto date, with suggestions for the future.

II. A review of the theory and practice of manuring in India with suggestions for the future:

(*a*) with reference to farmyard manure and compost,

(*b*) with reference to green manuring,

(*c*) with reference to manuring with artificial manures.

III. A review of work on the improvement of bullock-drawn implements, with suggestions for the future.

IV. A review of plant breeding in India with suggestions for the future.

V. A review of the work done on water requirements of crops with suggestions for the future.

VI. A review of work done on crop protection, with suggestions for the future with reference to protection from (*a*) wild animals, (*b*) insects, (*c*) fungi, (*d*) parasitic flowering plants and (*e*) effects of climate.

VII. A review of the present position regarding agricultural statistics (in the sense of collection and publication of data) and forecasting, with suggestions for the future.

VIII. A review of the application of statistical theory to experimental method in India so far as agricultural investigation is concerned.

The meetings gave an opportunity for an exchange of views on various subjects of practical importance to workers on crops and soils and the papers which were circulated were very useful. The Proceedings will, as usual, be published shortly. The following are some of the principal recommendations of the Board:—*Soils*:—While recognising the need for Soil Surveys of limited nature for special purposes and to suit local conditions, the Board recommended that steps should be taken to adopt the genetic system of soil classification. It suggested that all provinces and states should collect a museum of indigenous implements in use and prepare and publish descriptions with photographs of all indigenous implements as well as improved types in use in their territory. The Board recommended that plant breeders should in the course of their work attempt a study of genetical variability with the objects of cataloguing the characters available for use in planning new crop types and building up a picture of the genetical composition of the species. Attention was drawn to the necessity for increased scientific research on the relations between soil, water and growing crops and on allied problems connected with irrigation—agriculture. The importance of adequate and accurate statistics of agricultural production was emphasised.

29. *Standing Wheat Committee.*—The second meeting of the Wheat Committee was held at Simla on the 9th and 10th September 1937. The Wheat Research Sub-Committee met on the afternoon of the first day and submitted a report on the following research schemes to the full Committee:—

(1) The 'Cereal Rusts' research scheme (Dr. K. C. Mehta).

(2) The breeding of rust resistant wheats, at the Simla sub-station of the Imperial Agricultural Research Institute financed by the Imperial Council of Agricultural Research (Imperial Economic Botanist, Dr. Pal, in collaboration with Dr. K. C. Mehta).

The Committee's recommendations were subsequently considered by the Advisory Board and are referred to under the individual schemes.

The Research Sub-Committee also considered the question of the registration of wheat varieties and recommended that this should await the result of the work in progress by two special sub-committees of the Council which were dealing with the description of the varieties of rice and cotton. It also considered suggestions for reducing the incidence of rust in the hill areas which serve as the starting point of the main wheat areas of the plains and it was agreed that full details should be worked out by the Research Council to see what practical steps could be taken. The Report of the Sub-Committee was approved by the full Committee.

2. The Wheat Committee devoted considerable time to the discussion of the major conclusions contained in the report on the Wheat Marketing Survey with which they were in agreement. The progress made in the standardisation of the wheat "futures" contract for India (referred to elsewhere in this report) was noted and discussed. Emphasis was laid on the desirability of encouraging better storage, special reference being made to the concrete bins in use in Muzaffarnagar. The

Committee noted that broadcasting of wheat market prices had been started and recommended that these broadcasts should also be published in newspapers. This recommendation has been accepted and acted upon.

3. A considerable time was given to a discussion of the position reached in the introduction of improved varieties of wheat into general cultivation, the methods used in different provinces for organising seed supplies were compared and it was noted that efforts were being intensified both in the Punjab and the United Provinces, in the latter province with the aid of funds from the Central Government's rural development grant. The need for a more extensive organisation for the supply of improved seed in Sind was emphasized. The Committee agreed that both from the point of view of marketing and from the agricultural standpoint it was necessary that the number of improved types selected for distribution should be limited and that the policy of building up compact blocks of single varieties was the correct aim.

Notes from several Provincial Governments and provincial representatives on the economics of wheat production were considered and discussed. The general view was that the principal requirement was an intensification of the organisation for seed supply and better organised marketing. The latter is fully dealt with in the Wheat Marketing Survey Report.

Amongst plant breeding problems it was noted that there is a need for rust-resistant types of wheat in Sind. A brief discussion took place on the need of facilities for carrying out milling and baking tests in India and the Committee noted that the milling and baking test laboratory at Lyallpur, for which the Research Council made a grant, would be in operation in 1938.

In view of the revival of the Indian export trade, attention was drawn to the desirability of trial shipments of new varieties being made. Attention was also drawn to the magnitude of the Indian flour milling industry and the substantial quantities of high quality wheat which are required annually for that purpose. It was noted that strong wheats are equally required for internal consumption, both for *chapati*-making and for modern mills and for export purposes. The Committee noted that discussions were in progress with the Liverpool Corn Trade Association with a view to ascertaining whether Indian wheat could be made tenderable against the Liverpool wheat 'futures' contract. Since the Committee met, it has been ascertained that there is no objection on principle to Indian wheats being made so tenderable, provided that a regular export trade continues and provided that wheats of satisfactory cleanliness, not liable to weevil in storage, could be shipped in commercial quantity. Wheat of the general average quality shipped in 1936-37 would not be acceptable for this purpose but a small trial shipment, made about the time when the Committee was sitting, proved to be of satisfactory quality and demonstrated that it was commercially practicable to ship Indian wheat of satisfactory quality.

30. *XIIth International Horticultural Congress, Berlin, 1938.*—An official invitation to be represented at this Conference having been received by the Government of India the Council arranged for the following delegation:—

Dr. W. Burns, D.Sc., I.A.S., Agricultural Expert, Imperial Council of Agricultural Research.

Dr. H. Chaudhri, M.Sc., Ph.D., Reader in Botany, Punjab University, Lahore.

Mr. K. C. Naik, B.Ag., (Bombay), M.Sc. (Bristol), Horticulturist in charge of the Council's fruit research scheme in Madras.

31. *Statistical Section.*—(i) During the year, the Statistician (Rao Bahadur Vaidyanathan) was on study leave for about six months in the United Kingdom the greater part of which was spent in the Statistical Section of the Rothamsted Experimental Station. During this period he also attended Dr. Wishart's course of lectures at Cambridge, Dr. Fisher's lectures on Combinatorial Analysis at University College, London and visited some other Agricultural Experiment Stations. During the period of his leave Mr. S. S. Iyer, Statistical Assistant was in charge of the Section.

(ii) The principal activities of the section were continued. These are (1) scrutiny of technical programmes and progress reports, (2) assistance to agricultural and veterinary research officers in the various provinces and constituent Indian States in the planning of experiments and the statistical interpretation of the results. The Statistician or his assistant visited many of the schemes, to give advice on the spot.

(iii) As recommended in Sir John Russell's report, the Statistician has collated the results of manurial experiments on rice in Imperial Council of Agricultural Research schemes during the past 5 years. These are now under the consideration of the Council. Similar work is being undertaken with regard to experiments on sugarcane. It is proposed on the basis of these results and the results of other experiments in the Provinces and States to replan the whole system of manurial experiments on these crops and in particular to arrange for identical or similar experiments to be carried out simultaneously at all stations.

(iv) References from Provinces and States asking for statistical advice and assistance on matters connected with experiments in agriculture and in animal husbandry increased from 85 during last year to 112 this year.

(v) Two papers—one on "Spacing Experiments" and another on "Improvement of Agricultural Statistics in India" were read at the meeting of the Board of Agriculture held at Lahore in December 1937.

(vi) Both the Statistician and the Statistical Assistant attended the First All-India Statistical Conference held in Calcutta in January 1938, and also attended the special lectures given by Dr. Fisher, who presided over the Conference.

32. *Locusts.*—(i) *Locust Swarm Movements.*—Although in Egypt and Sudan the activities of a few swarms were reported during the year by the Imperial Institute of Entomology, London, within the limits of India there were no reports of any swarms of the Desert Locust during the year under report. From the Sirohi State and from Mehsana District of the Baroda State, however, reports of locust infestations were received in October—November, 1937, which proved, on investigation, to be due to the attacks of *Locusta migratoria* ph. *solitaria* in the hopper stage.

(ii) *Locust Survey Work.*—The work was carried out on the same lines as those of the year previous, intensive surveys being carried out in the neighbourhood of various Outposts and Stations, and extensive surveys in the various areas under observation. Owing to the detection of heavy breeding during the early part of the current year in parts of Kachhi and Upper Baluchistan, and later on in Gujarat and Kathiawar,

these parts also had to be surveyed periodically by the Survey staff in addition to the usual areas.

(iii) *Ecological Work.*—Studies were continued at Pasni and Ambagh on the lines of the previous year. Experiments in regard to the effect of different food-plants on the life-economy of the locust were also continued.

(iv) *Locust Developments in 1937-38.*—(A) *Schistocerca gregaria*—The Desert Locust.—(*a*) *Winter Period, 1936-37.*—Over-wintering of locusts was observed in the coastal areas of Mekran and Lasbela, as also in the areas of eastern Jaisalmer and western Bikaner, where the heavy development of a second monsoon generation of the locust had been observed during the months October—November 1936. Locusts remained in the Jaisalmer—Bikaner areas till the middle of February after which they disappeared, and it is considered probable that they had migrated westwards into the Kachhi-Bolan area.

(*b*) *Breeding in Spring, 1937.*—The winter rainfall of 1936-37 proved to be rather abnormal. Whereas there was little or no rainfall along the coastal areas of Mekran, fairly good falls were recorded in the areas of Lasbela, Kachhi and Upper Baluchistan, and also in parts of northern Rajputana. The breeding of the solitary phase type of the Desert Locust that followed also closely corresponded with this rather peculiar distribution of rainfall. While there was no breeding along the coastal areas, hoppers were observed in varying numbers in April, May and June in the interior valleys of Mekran, in Kachhi, in the Baluchistan valleys, and in parts of Jaisalmer and Bikaner. In the Lasbela area, a case of incipient swarming was noted in cultivated fields in the neighbourhood of Sheh Lakhra, as also fairly heavy breeding in parts of Kachhi and in the Bolan valley. As a result fairly good numbers of adults of the new generation were observable in April-May in the areas of breeding, especially in Kachhi, North Rajputana and Bolan valley.

(*c*) *Summer Migration.*—During May and June, 1937, adult locusts of the newly developed generation were found gradually disappearing from Kachhi, Bolan and Lasbela; at the same time, the locust population in the areas of Jaisalmer, Bikaner and Thar was noted to be increasing in numbers, indicating that a migration of locusts from west to east had been taking place. At Pasni and Gwadar also, the appearance of small numbers of locusts of a recently developed generation was observed in June, which could only have been due to an immigration from elsewhere, owing to the total absence of local breeding.

(*d*) *Summer Breeding.*—Heavy rainfall was registered in many parts of the desert during the latter half of June and during July. Rains were specially heavy in the eastern parts of the desert, as for instance in east Bikaner and the western parts of the Jaipur State. Fairly dense concentrations of the Desert Locust were noted in the Sadulpur-Pilani-Jhunjhunu areas in the eastern parts of the desert during July, followed by heavy breeding in July-August. Fairly heavy breeding was also noticeable in the Thar-Mallani-South Jaisalmer areas in the south, but there was little or no breeding in the eastern and northern parts of Jaisalmer owing to deficient rainfall.

There was a pronounced period of drought during August throughout the Sind-Rajputana desert areas, which appears to have brought about an emigration of the newly developed adults of the monsoon generation in

a south-westerly direction. There was fairly definite evidence to indicate that the direction of the migration had been influenced mostly by the general north-east to south-west direction of the storms connected with the advance of the Bay depressions across the desert.

During the second week of September there was fairly good rainfall in many parts of the desert—especially in the Thar area, which gave rise to the development of a second monsoon generation of the locust in parts of east Bikaner, Mullani and Thar.

(*e*) *Autumn Migration.*—In the Rajputana area, the autumn migration was noticed to have begun as early as August, in consequence of the prematurely early development of conditions of drought in the desert during that month. Migration continued to be intermittently active during September, October and November, the periods of activity generally coinciding with the prevalence of north-east winds. The first indications of the arrival of the migrants from the east were noted at Ambagh in September, whereas at Rumra, Pasni and Gwadar they were observable during October. The migrants were found to have mauve or pink wing-bases as in the years previous.

(*f*) *Winter Period, 1937-38.*—Corresponding with the absence of late breeding in the Jaisalmer-Bikaner areas, there was no over-wintering of locusts in these areas, whereas a fairly good population of locusts was observable in winter in the Thar-Mallani area, where a second monsoon brood had been produced. Over-wintering was also noted in the coastal areas of Lasbela and Mekran.

(*g*) *Spring Breeding, 1938.*—Fairly good winter rainfall occurred on the coastal areas of Mekran during December, 1937 and January and February 1938, and since over-wintered locusts were present in these areas in fair numbers, it is expected that somewhat extensive spring breeding may take place.

To sum up, early and heavy monsoon rainfall in the Rajputana Desert area led to fairly extensive breeding during July-August 1937. Owing, however, to the occurrence of a long break in the rains during August, there was very little further breeding except in the Thar-Mallani region. *If, on the other hand, good rainfall had continued in August and September, it is possible that further multiplication might have led to the formation of large concentrations which, in the event of favourable winter rainfall in Mekran, might have brought us to the verge of a new locust cycle.*

(B). *Locusta migratoria.*—The Migratory Locust.—Although specimens of the solitary phase of this locust have generally been noted in past years, in small numbers, along with the Desert Locust, in the course of survey work in most parts of the desert areas, no extensive breeding had so far been observed anywhere. This year, however, two cases of fairly serious damage to cereal crops, in the Sirohi and Baroda States respectively, were reported in October and November 1937. In these instances, hoppers were found in very large numbers on *jowar*, millets, sugarcane and paddy, which in many cases were observed to have suffered total defoliation. By November, however, most of the locusts were found to disappear after attaining the winged stage.

From observations made by the Locust Survey staff during the year in various parts of Sind, Rajputana and Baluchistan, it is possible to trace these infestations to their probable origin. During May and June, heavy breeding of *Locusta* was detected in the Kachhi and Bolan areas of Baluchistan. By July, however, very few specimens were to be seen in

these areas; on the other hand, a dense *Locusta* population was observable in parts of east Bikaner in July, followed by heavy breeding in these areas, as also by light breeding all over the Desert area. By August-September the large *Locusta* population was found to have disappeared from these areas, and it is presumed that it had migrated, not in the form of a dense swarm, but as a large diffuse body of solitary individuals, into Sirohi, Gujarat and elsewhere and had laid eggs there, thereby bringing about the heavy hopper infestation reported there. Some specimens were found in Simla. By November-December, 1937, very few *Locusta* adults were noticeable in Gujarat or in the desert areas, whereas fairly large numbers were observed by the Survey staff in Juari fields along the Sind-Lasbela borders.

There would, thus, appear to be much presumptive evidence in regard to the ability of this species also to make long-distance migrations like the Desert Locust. Further developments in regard to this locust are being watched by the Locust Survey staff.

(v) *Study of Old Records.*—(*a*) The mapping of the locust data for the years 1889 to 1925 has been completed and the data are under study.

(*b*) Much time was also devoted to the study of various locust data in correlation with all available meteorological data extracted from the India Daily Weather Reports for the years 1889-1931.

(vi) *Extension of the Scheme.*—As a result of the recommendation made in Sir John Russell's Report, proposals are at present under consideration for the transfer to the Central Government of that portion of the work on locusts which involves a permanent or semi-permanent locust warning service. Pending a decision on this point, the Governing Body has sanctioned the continuance of the scheme, on its present basis, as a temporary measure.

Locust Research Scheme at Lyallpur.—The scheme for research into the biology and bionomics of the Desert Locust under the supervision of the Entomologist to the Government of the Punjab at Lyallpur was sanctioned for a period of three years from the 1st April 1936. The results of the research are now being written up.

Locust Committee.—At its ninth meeting on the 8th March 1938, the Committee reviewed the research work done by the staffs working under (1) the Council's Locust Research Entomologist, (2) the Entomologist to the Government of the Punjab and indicated the lines on which the work in question should proceed during 1938-39. The Committee discussed the resolutions and recommendations adopted at the Fourth International Locust Conference held at Cairo in April 1936. The occurrence of *Locusta migratoria* in India in unusual numbers during the year 1937 was brought to the notice of the Committee.

Central Locust Bureau.—The Central Locust Bureau was established in 1930, and has been continued on a skeleton basis since the termination of the last visitation. At present its main function is to receive information from the various Provinces and States and from reporters in Persia and Arabia and to collate and transmit it to the Provincial and State Departments of Agriculture. The Bureau also issues weekly locust warnings as occasion arises.

During a small invasion by *Locusta migratoria* in Mehsana (Baroda) towards the beginning of November 1937, the Bureau supplied sodium fluosilicate to the authorities for destroying the locusts. Sodium

fluosilicate has also been supplied to the North-West Frontier Province, the Imperial Agricultural Research Institute, the Islamia College, Peshawar and to Hyderabad State.

A request has been received from the Imperial Institute of Entomology, London, for statistics regarding the damage caused by locusts in India during the years 1925-34 and the information is being collected.

33. *Agricultural Marketing.*—(i) *Introduction.*—It will be recalled that in 1934-35 the Government of India had decided to embark on a comprehensive scheme for the improvement of agricultural marketing in India. The programme of work and the mode of financing the measure were outlined in the Council's report for that year. The average annual cost of the Office of the Agricultural Marketing Adviser which was established by Government as an Attached Office of the Imperial Council of Agricultural Research Department for a period of five years with effect from 1st January 1935, approximates Rs. 2½ lakhs. In addition, the Government of India give the Council a special grant of Rs. 2 lakhs every year for allocation to the Provincial Governments as an aid towards the maintenance of a local marketing staff. The Central Government's liability in that behalf is limited to a period of five years ending 31st December 1939. Several Indian States also agreed to co-operate in the marketing work by appointing their own separate marketing staff or by nominating some of their existing officers for the purpose. The number of such States is now in the neighbourhood of 250. The progress made with the scheme during the year under review is briefly stated in the succeeding paragraphs.

Earnest efforts were made from the commencement of the year under review to put into practical effect the preliminary results obtained in the course of the marketing surveys up to date. Much of the information collected by the central and local marketing staffs in regard to grains, oilseeds and ghee was compiled for use in discussions with the producers and trade interests concerned. The available material was summarised and printed in the relative proceedings of the various conferences held throughout the year. Similarly the first results of the marketing enquiries in regard to milk and dairy products were made available to Dr. N. C. Wright and published in his report to the Imperial Council of Agricultural Research on the Development of the Cattle and Dairy Industry of India.

At the same time the preliminary surveys showed that the selling of mixed produce of doubtful quality is a common practice. This not only makes the collection and comparison of prices difficult but involves unnecessary expense in the handling and transport of worthless goods. Returns to producers are also thereby reduced on account of the higher labour costs in cleaning and sorting the produce at consuming centres. There proved to be, therefore, a *prima facie* case for the better grading of agricultural produce in order to eliminate waste and provide a common basis for trading on standard quality to the advantage of both producers and consumers.

With this end in view legislative proposals were prepared and the Agricultural Produce (Grading and Marketing) Act was passed by the Central Legislature in February 1937. To give a practical lead to all concerned the central marketing staff initiated the grading and marking of different commodities at more than 30 centres. Although some of those grading stations were only running for a short period towards the end of

the year the total value of the graded produce put out under the "Agmark" exceeded Rs. 10 lakhs. The success achieved at these centres in spite of many difficulties clearly indicates that there is a demand for graded goods and that particularly for perishables such as eggs and fruits, producers can in many cases secure considerably better returns by proper grading. Provincial and State marketing staffs have assisted in establishing these grading stations and with the experience so gained they should, if given necessary backing by their Governments, be able to develop this side of the work very rapidly in the immediate future.

Substantial progress in regard to the standardisation of uniform contract terms was also made with the helpful co-operation of many trade associations covering the whole of India. The year under review may, therefore, be regarded as one of real practical achievement. The activities of the marketing staff in various directions are set out in more detail below and the growing nature of the work will be evident therefrom.

(ii) *All-India Marketing Surveys.*—The full report on the marketing of wheat in India was published as also its abridged editions in English, Hindi and Urdu. Only one other marketing survey report was actually published, namely, that dealing with the cold storage and transport of perishable produce in Delhi. By the close of the year, however, the whole of the linseed report, four chapters of tobacco report and a chapter of each of the reports on eggs and grapes had been sent to the press, and the remaining chapters were practically ready for the press, along with the reports on grapes, eggs and coffee. In order to expedite the issue of these all-India marketing survey reports an officer on special duty was appointed for the purpose in July.

Before the end of the year nearly all the Provincial and State reports had been received in respect also of cattle, hides and skins, milk, rice, bananas and co-operative marketing and the all-India reports on these commodities were being drafted. Local marketing surveys were in progress in regard to oranges, apples, mangoes and certain other fruits, and on barley, gram, maize, brassica, oilseeds, coconuts, potatoes, wool and hair, sheep and goats and ghee as well as on markets and fairs. In amplification of the material collected through the local marketing staffs, questionnaires in respect of these various commodities were issued by the central marketing staff to all minor States which are not in the position to maintain full time marketing officers.

(iii) *Special Marketing Surveys.*—The foregoing marketing survey work is being carried on by the central marketing staff and by the marketing officers appointed by various Provinces and States. In the course of the year, however, various statutory All-India Central Commodity Committees decided to have their own marketing staff to carry out special surveys on the products concerned. The work of these special officers will, however, be supplemented by enquiries instituted by the existing local marketing staffs and the assistance of the central marketing staff will be used in directing the work generally.

(*a*) *Lac.*—With a view to organising a marketing survey the Lac Cess Committee placed certain funds at the disposal of the Agricultural Marketing Adviser. The staff have already been appointed and a beginning has been made with marketing survey work.

(b) *Jute.*—The Indian Central Jute Committee, which was constituted in the course of the year, decided as one of its first steps to undertake a marketing survey and for this purpose appointed a Senior Marketing Officer, a Marketing Officer and two Assistant Marketing Officers who commenced survey work in September on the basis of a synopsis and programme of work which had been previously prepared by the central marketing staff.

(c) *Sugar.*—The Government of India placed a fund at the disposal of the Agricultural Marketing Adviser for expenditure in regard to the improvement of sugar marketing in India. For this purpose a Marketing Officer and two Assistant Marketing Officers with a nucleus staff were appointed temporarily with effect from 1st December. A synopsis and programme of work had been prepared in advance so that survey work commenced at once in time for the 1937 sugar season.

(d) *Coffee.*—The Marketing Officer of the Indian Coffee Cess Committee continued to be attached to the central marketing staff and by the end of the year had completed the compilation of local reports and commenced on the first draft of the all-India report.

(iv) *Grading Stations.*—With the primary object of finding out methods of grading suited to different commodities in different areas and of demonstrating these to the trade and secondly to show producers and the trade the practical possibility of obtaining a premium on graded as compared with ungraded produce, a number of experimental grading and marking stations were established at different centres throughout India. As usual, a lump sum grant of Rs. 20,000 was made by the Government of India for work on grade standards during the year. It was, however, recognised that experimental work of the kind referred to should be extended and adequate records be kept to show whether grading was profitable or not. This necessitated the provision of additional funds, and as stated in the Council's report for the previous year, the Council agreed to give the Agricultural Marketing Adviser a special grant not exceeding Rs. 36,000 to enable him to meet expenditure on supervisory staff, recorders, etc., in connection with the grading and marking stations for a period of one year commencing 1st April 1937. On the basis of the detailed estimates prepared by the Adviser in this connection, sanction was conveyed to him for a grant of Rs. 31,000, out of which a sum of Rs. 28,778 has actually been spent.

(a) *Hides.*—Hide grading stations were established at Delhi and Agra and also, towards the end of the year, at two of the slaughter houses in Calcutta. Altogether about 1½ lakhs of hides were graded and marked. Towards the end of the year when the experimental period was due to expire at Delhi and Agra the parties concerned undertook to carry the labour cost, representing about 1/3rd of the total, provided the stations were continued for a further period, until such time as the market for graded hides could be more firmly established. Important hide merchants and tanners were kept informed of the progress of the work of these grading stations by means of weekly summaries. In spite of opposition from certain parties who considered that their interests as middlemen were being threatened, the trade was showing a growing interest in graded hides before the end of the year.

(b) *Eggs.*—The Pabbi egg grading station in the North-West Frontier Province which was established in November 1936 concluded its experimental stage in November 1937 by which time it had graded nearly 26

lakhs of eggs. The experiment showed that the graded eggs could be sold at a premium. The success of the experiment induced the local collectors to form a co-operative egg sale society which at the end of the experimental period purchased for Rs. 860 the grading machine which had been obtained on loan and took over entirely the running of the grading station as a commercial concern from that date. During the short period of its working the Association made a net profit during 8½ months, ending 31st July 1937, of Rs. 4,000 on a paid up net capital of Rs. 2,500 only and at the same time paid to the actual producers high prices than in the preceding year. The results are therefore encouraging. The records at this station show that 4 to 6 per cent. of the eggs are stale, cracked or otherwise unfit to be put on distant markets and should be disposed of locally. After allowing for this produce the total returns received for the balance of graded eggs showed an increase of about 10 per cent. It is hoped during the ensuing year to conduct tests on improved containers in conjunction with the Association since preliminary trials indicate that breakages in transit alone can be reduced by 1 or 2 per cent. in this way.

Other grading stations for eggs were opened at Kottarakara and Chenganoor in Travancore and at Delhi and Calcutta towards the end of the year. The station at Chenganoor having been closed on 17th January 1938, the grading work has been taken up by a Quilon merchant, who is meeting the entire cost except the pay of Recorder and rent of premises. Three egg merchants in Bombay have also been granted certificates of authorisation to grade and mark eggs in accordance with the rules; the cost of a hand grading machine and pay of 2 coolies for two months only will be borne by this office. Similar work is expected to be started at Bareilly and Lucknow. The total number of eggs graded and marked at all these stations amounted to 52 lakhs.

At the first two stations which were opened mechanical grading by means of somewhat expensive machines introduced from England was tried and found economical so long as 5,000 or more eggs were handled each day. For the smaller stations a comparatively inexpensive apparatus has been devised for use in hand grading and is proving quite successful.

(c) *Fruits.*—During the year several grading stations for fruits were established in various parts of the country as the season for the different fruits came round. The first station to deal with Santra oranges was opened at Nagpur in February where over 7,000 baskets of fruit were graded in the course of three months. From the records of this station it appears that about 15 per cent. of the fruits suffered from damage and blemish to such an extent as to make it unprofitable to send them to distant markets. Tests were made by sending to different consuming markets an equal number of packages of graded fruits and of oranges as they normally come from the orchard. The results showed that even after eliminating the damaged and blemished fruits the net return on the graded produce was 6 per cent. higher than the total return on the full quantity of ungraded fruit without taking into consideration the saving in freight through not sending "throw outs" and poor quality produce to the distant markets.

A grape grading station was started at Nasik in March and about 33,000 lb. of grapes were graded and marked in the course of 3¼ months. Another station for grapes was started in Sheikh Mohammadi in the North-West Frontier Province in the middle of July where the local producers formed a co-operative society for the purpose. The results in this case

showed a premium of 15 per cent. on the graded produce as against the ungraded.

Mechanical grading experiments were conducted for peaches and plums at Tarnab Farm for three months during the summer but the machine proved unsuitable for this work owing to the amount of damage it did to the fruit and hand grading was resorted to. Similarly, later in the season when an experimental station for the grading of apples was opened at Kashmir, mechanical grading had to be abandoned in favour of hand grading. Towards the end of the year grading stations were started for oranges at Sylhet (Assam) where mechanical grading was employed and for Mozambi oranges at Rahuri in the Bombay Presidency and at Rangpo in Sikkim where hand grading experiments were carried out in co-operation with the parties concerned locally. It was proposed to conduct further experiments on mechanical grading with mandarins in Coorg, but the season having closed earlier the machine could not be sent. An orange merchant in Nagpur, who successfully conducted grading last year, expressed a desire to try grading this season as well, meeting the cost of manual labour necessary for the purpose. The machine has accordingly been sent there and the work is progressing satisfactorily.

These experiments have shown that it is doubtful whether mechanical grading will be found suitable for any fruits other than oranges. Apart from the fact that the accidental error in selecting different sizes is somewhat greater in the case of hand grading this system appears to be more generally suitable for Indian conditions and fruits. Although mechanical grading will be tried further the probability is that it would be better in future to increase the number of hand grading experimental stations.

Reference might also be made here to the fact that in conjunction with the Agriculture Department in Bombay commercial consignments of graded mangoes bearing the "Agmark" amounting to about 9 tons were despatched to London during the first half of the year and the results were found to be moderately encouraging.

It should perhaps be noted that although there are great potentialities in grading it requires time for the graded produce to make any impression on the market. In the initial stages until buyers in general become aware of the existence of the graded produce an appreciable premium for the higher quality cannot reasonably be expected. Enquiries have shown that unless sufficiently large quantities of graded produce are regularly available on the market it does not interest the big buyers. It is therefore difficult to obtain the maximum premium on the graded goods. The results of the experimental period can therefore only be taken as a guide and not as an indication of the full value which is likely to arise from a wider adoption of systematic grading.

It should also be recognised that there are many practical difficulties in the way of starting these grading stations. This is only to be expected during a short experimental period but better results should be obtained when more permanent grading stations are established and the market is kept regularly supplied with graded produce. This, however, falls within the sphere of marketing development work of Provincial Governments. So far as the central marketing staff is concerned the policy is to close down these experimental stations at the end of the season or when they are taken over by the parties concerned and new experiments are then commenced at other centres for different kinds of produce.

(d) *Tobacco.*—During the year members of the Indian Tobacco Association at Guntur disposed of experimental consignments to the extent of 300 bales (75,000 lb.) of cigarette leaf graded and marked in accordance with the rules made under the Agricultural Produce (Grading and Marking) Act. These met with a somewhat mixed reception on the London market, particularly on the part of the brokers who appeared unwilling to quote separate prices for the different grades. Certain cigarette manufacturers, however, expressed their appreciation and surprise that such excellent quality of cigarette leaf could be obtained in India.

(e) Ata.—With a view to introducing the sale of graded *ata* (wholemeal wheat flour) experiments were conducted at Delhi during the first half of the year and 810 maunds of conditioned and cleaned wheat were ground, graded and sold under "Agmark" labels. As cereal products are not included in the schedule of the Agricultural Produce (Grading and Marking) Act it was not possible to issue certificates of authorisation for the continuance of this work, but the results of the experiment were so encouraging that one of the local *chakki* owners has introduced a similar system and is selling graded *ata* bearing his own brands and labels. Similar experiments on the sale of graded *ata* are being carried out at Lahore and about 160 maunds of wheat had been ground by the middle of March.

(f) *Ghee.*—In accordance with the recommendations of a ghee conference held in September, experimental grading and packing stations for ghee were established at Khurja, Firozabad, Aligarh, Hathras, Sirsugunj and Jaswantnagar before the end of the year and a central ghee quality control laboratory was established at the Harcourt Butler Institute, Cawnpore. Although the season was only just beginning, over 12,000 maunds had been tested and graded in accordance with the prescribed specifications before the end of the year. The produce was found to be of a high standard of quality and the proportion falling into the different grades was as follows:—

Buffalo	...	—
Special	...	97·6 per cent.
General	...	2·4 per cent.

At the time of the ghee conference representatives of the trade in Kathiawar had asked for a special survey to be made of that area as it was claimed that local ghee although pure could not comply with the analytical standard of quality laid down at the conference. A special survey of that area was therefore put in hand.

(v) *Standardisation of Contract Terms.*—The chief object of having standard trade contracts is to reduce within practicable limits the amount of refraction (dirt and other impurities) in the product and to encourage the sale of clean produce by having a scale of mutual instead of non-mutual allowances inserted in the contract. In the case of non-mutual terms the seller gets no reward for delivering produce better than the minimum basis. There is therefore a direct incentive to lower the quality to the minimum. The significance of this may be appreciated from the fact that for linseed alone, which is shipped to Calcutta, where a non-mutual deduction on account of refraction is always made, it is estimated that further additional charges amounting to about Rs. 3 lakhs per annum fall to be borne by producers on account of freight and cleaning costs in respect of dirt carried to the port. By making price quotations comparable

in different markets standard contracts not only facilitate inter-trading but make the machinery of distribution much more efficient generally. With this object two conferences were held during the year with trade and manufacturing interests connected with grain and oilseeds.

In April a conference was held in Delhi with a view to drawing up the final terms for a standard contract for white wheat and preparing one for linseed. The proposed terms of the wheat contract have been finally agreed to by several of the associations and negotiations are proceeding with a view to deciding on a suitable date for bringing the new contract into operation.

The terms of the proposed linseed contract have also been accepted in substantial measure by the trade and manufacturing interests concerned. From the producers' point of view it is important to notice that the terms have been so arranged that not only will there be an incentive to put clean produce on the market but a premium commensurate with the higher oil content will be paid on the bigger 'bold' types of linseed.

A further conference with trade associations and manufacturers was held in Bombay in September when the terms of a standard contract for groundnuts were drawn up. The provisional contract was circulated for detailed consideration by the various interests concerned and the terms were being re-examined in the light of the observations which had since been put forward by certain associations.

(vi) *Analyses of Samples.*—An important part of the headquarters work on grade standards consists in the collection and examination of a large number of samples of the different commodities. Arrangements were made with various institutes throughout India to carry out the physical and chemical analysis of the following products.

Three hundred and eighty-three samples of barley were examined for refraction, size, nitrogen content, etc., at the Imperial Agricultural Research Institute, New Delhi, of which about two-thirds were also submitted to malting tests at the Solon Brewery and analysed for diastase.

The Cerealist, Punjab Agricultural College, Lyallpur, examined 469 samples of gram and 351 samples of maize in respect of refraction, size and water content.

At the Harcourt Butler Institute, Cawnpore, 762 samples of rape seed, *toria* and mustard seed were subjected to a physical examination. Over 200 samples were analysed for oil and water content and 60 samples specially tested for pungency. Various samples of *taramira* oil and 142 samples of other brassica oils were analysed. 112 samples of ghee were also analysed.

The Agricultural Chemist, Mysore, analysed 121 samples of ground coffee, including tablets. The Coffee Scientific Research Officer, Balehonnur, examined 184 samples of raw coffee and 73 samples of roasted beans. Coffee liquoring tests were carried out on a number of samples at both those centres and also on a commercial basis at Mangalore.

The Chief Inspector of Stores and Clothing, Cawnpore, conducted a systematic analysis of 159 samples of market wool. These were tested for length, crimp, percentage loss in scouring and for fineness and the presence of kemp. These samples were subsequently classified on a commercial basis by one of the mills at Cawnpore.

Following the recommendations of the Marketing Officers' Conference, 1937, the Mysore Government were considering a draft bill for establishing regulated markets for agricultural produce in the State. A proposal for starting two regulated markets for jute was being considered by the Bengal Government and Indian Central Jute Committee.

(vii) *Market News Service.*—Weekly broadcasts from Delhi in English and vernacular regarding prices, stocks and movements of wheat, linseed and rice were continued during the year. The popularity of the service induced the All-India Radio to add to their daily programme, the broadcasting of the daily closing rates at Hapur market in respect of wheat, barley, gram, peas and *arhar*. Somewhat similar steps were also being taken by provincial marketing officers to improve the system of marketing news service.

(viii) *Railway Statistics.*—As a result of negotiations between the Imperial Council of Agricultural Research and the Railway Board the latter agreed to request the agents of the State Railways to supply the local marketing staffs with statistics in respect of the commodities under survey free of charge up to a certain financial limit. The leading Company Railways were approached at the same time and all the main railways, in addition to those referred to in last year's annual report, have now kindly agreed to meet the reasonable requirements of the local marketing staffs in this connection. This policy has been adopted as an experiment for one year in the hope that the railways may themselves secure some benefit from the all-India marketing survey reports.

It may perhaps be observed at this point that the commercial branch of several railways on being consulted by local marketing officers have been very helpful in arranging for special freight rates from a large number of centres, particularly on perishable commodities such as fruits and eggs.

(ix) *Miscellaneous.*—A Marketing Officers' Conference was held as usual in the course of the year. One of the main decisions arrived at was that greater emphasis should be laid in future on development work, particularly in the way of:—

(1) the establishment of more grading and packing stations under the Agricultural Produce (Grading and Marking) Act,

(2) the regulation or registration of markets and market charges,

(3) the standardisation of weights and measures, and

(4) an improved market news service for producers.

It was recognised, however, that this work could not be carried out without the backing of the local governments and other departments concerned in the provinces and States, and that local marketing staffs would require some additional funds and staff for the purpose.

In the course of the year the Agricultural Marketing Adviser attended various provincial conferences with regard to sugar and also attended meeting of the Indian Central Jute Committee, and the Lac and Coffee Cess Committee to discuss marketing questions. He also acted as member of a committee to consider the improvement of the road, rail and river-borne statistics published by the Director General of Commercial Intelligence and Statistics.

A conference was also held in January of the Western Indian *rabaries* (cattle breeders) who wished to discuss certain difficulties connected with the rearing and marketing of cattle in their area.

Apart from the grain and oilseeds conferences, already referred to, a representative conference of ghee producers and others was held in Simla in September when proposals were formulated for the standardisation of ghee and the establishment of ghee grading and marking stations. In Bombay another informal conference was held to discuss with the trade representatives, the results of special investigation into the chemical quality of Kathiawar ghee.

With the object of reviewing the results of the experimental scheme for the grading and marking of hides and to discuss other cognate matters, a second informal conference was held at Cawnpore with the representatives of the tanning industry and other interested parties. The conference recommended that the working of the experimental hide grading stations should be continued for a further period and on a more extended scale. It was decided also that in order to encourage careful flaying the system of paying premium to flayers be continued and, as a token of their interest in the work, some of the tanners present agreed to contribute towards this expenditure. In the light of the experience gained certain minor modifications in the rules for the grading and marking of hides were considered necessary.

A joint scheme of research in regard to refrigerated transport, financed by the Imperial Council of Agricultural Research, was, however, being continued when the year closed.

A certain amount of work was done at exhibitions during the year. A fruit grading machine, obtained on loan from England, was demonstrated at the All-India Agricultural and Industrial exhibition held at Lucknow. Material was also provided by the central marketing staff for the Delhi Province Rural Exhibition and the All-India Exhibition of Arts and Crafts at Lahore.

34. *Award of Prizes for distinct improvements in Agriculture and Animal Husbandry.*—(i) *Field implements and appliances, 1936.*—On the 7th June, 1933, the Imperial Council of Agricultural Research announced that it would award annually for a period of five years one gold and two or three silver medals for improvements of distinct merit and all-India importance in the science and art of agriculture and animal husbandry. Applications were invited in 1935 (for the award to be made during 1936) for improvements in field implements and appliances. In all 21 entries were received. A special judging committee was appointed to examine them and make recommendations. The entries selected by this committee were then subjected to several practical tests, and had to reach a certain standard of performance. It was decided to award two silver medals, one to Ch. Karam Rasul of the Punjab Agricultural College for his automatic drills for sowing cotton; and one to Mr. B. N. Sarkar, Senior Marketing Officer, Bihar, for his "Sukhada" cultivating attachments.

(ii) *Improvements in Agricultural Machinery.*—In 1936 applications were invited (for the award of prizes during 1937) for improvements in machinery for preparing crops for market, for food or for storage. In all 17 entries were received and considered by a judging committee. It has been arranged to test two entries under practical working conditions.

35. *Publications.*—(i) *Journals.*—The Council continued the publication of the three Journals.—*Agriculture and Livestock in India*; *The Indian Journal of Agricultural Science;* and *The Indian Journal of Veterinary*

Science and Animal Husbandry which all reached the eighth volume. The first two were issued bi-monthly and the last one quarterly.

The number of original articles published in *Agriculture and Livestock in India* was fifty-three, of which nineteen related to soils and crops, twenty to animal husbandry and the rest to subjects of general agricultural interest. In addition, the Journal contained seventy abstracts, thirty-six notes and twenty reviews. Among the original contributions in this Journal, the series of illustrated articles on the 'Sons of the Soil, (Studies of the Indian Cultivator)', should be mentioned. This series, which commenced with the May (1937) issue, presents intimate descriptions of many of the outstanding Indian cultivator-types. These studies have been written by agricultural officers who have had opportunities to study the cultivator at close quarters. The following articles in the series appeared during the year:—

1. The Bengal Cultivator.
2. The Burma Cultivator.
3. The Assam Cultivator.
4. The Kunbi of Gujarat (Bombay Presidency).
5. The Lingayat of the Karnatak.
6. The Maratha Cultivator.
7. The Punjab Cultivator.
8. The Madras Cultivator.
9. The Oriya Cultivator.

It is proposed to issue the series when complete in the form of a book. Mention may also be made of the following five articles in the series of 'Special popular articles for practical farmers', which were published during the year—

1. The Incidence and Control of Trypanosomiasis among Domesticated Animals in India.
2. The Search for New 'Genes'.
3. Verminous Pneumonia in Domestic Animals: Its Control and Treatment.
4. The Biological Control of Insect Pests.
5. Animal Diseases in Relation to Economy of Man and India.

Reference was made in last year's report to the decision to publish an Editorial in each issue of 'Agriculture and Livestock in India'. In pursuance of this decision 'Editorials' were published (from May 1937) on the following subjects:—

1. Report of the British Commonwealth Scientific Conference, London, September 1936.

2. Sugarcane Agriculture in India: Recent Progress.
3. The All-India Cattle Conference, 1937.
4. The Russell and Wright Reports.
5. Agricultural Marketing.
6. The second meeting of the Board of Agriculture and Animal Husbandry in India: Crops and Soils Wing.

There has been a general feeling that the Journal *Agriculture and Livestock in India*, though containing a considerable amount of instructional material, is not reaching a sufficiently large public and that it would have a much wider appeal if it were remodelled and issued at more frequent intervals. This question received the consideration of the Editorial Committee during the year, and it was recommended that the Journal should be issued monthly with a number of more popular feathers, and that an attractive cover and low price were necessary. The Committee's practical proposals in regard to the editorial staff, etc., required to carry out these improvements are under consideration.

In the *Indian Journal of Agricultural Science*, forty-nine original contributions were published, of which eighteen may be classed as botanical, nine as entomological, five as chemical, thirteen on plant diseases and one each on bacteriology, agricultural meteorology and horticulture. In addition, there were four research notes, one abstract and eleven book reviews.

Of the twenty-six original articles published in the *Indian Journal of Veterinary Science and Animal Husbandry*, fifteen related to diseases of livestock, eight to animal nutrition and three to dairying. The arrangement started in 1935 for publishing in this Journal abstracts of articles, selected from foreign literature with a view to their interest to Indian field workers, was continued. The number of abstracts published during the year was twenty-one.

(ii) *Preparation of Critical Monographs on Indian research work.*—One of the recommendations of Sir John Russell was that the Council should prepare a series of critical monographs on Indian research work, the records of which are at present found scattered in a large number of Reports of Experimental Stations and papers in various Journals. This proposal was considered by the Editorial Committee during the year. The Committee agreed that the Council should undertake the preparation of a few critical monographs and recommended that a start should be made with four subjects: *viz.*, Dry Farming, Rice Breeding, Rinderpest and Animal Nutrition. The Committee also suggested possible methods of getting this work done and its proposals are under consideration.

(iii) *Scientific Monographs and Miscellaneous Bulletins.*—The Council issued one Scientific Monograph and three Miscellaneous Bulletins during the year, *viz.*:—

Scientific Monograph No. 11.—Investigations on the Course and Distribution of the Nerves supplying Levator anguli scapuli and Rhomboideus muscles and the formation of the Phrenic Nerve in the Ox, with observations on certain Anatomical Deviations by H. N. Chelva Ayyangar.

Miscellaneous Bulletins.—No. 15.—Selected Clinical Articles, Part II, by G. K. Sharma, R. L. Kaura, S. Ganapathy Iyer, G. S. Khan and S. Mangrulkar.

No. 16.—Indian Grazing Conditions and the Mineral Contents of some Indian Fodders, by Dr. P. E. Lander.

No. 17.—A Brief Survey of some of the Important Breeds of Cattle in India, by Col. Sir Arthur Olver.

The following publications were in the press at the end of the year:

(*a*) *Scientific Monograph No. 12.*—The Fungi of India—Supplement I, by B. B. Mundkur.

(*b*) *Miscellaneous Bulletin No. 18.*—Milk Records of Cattle in Approved Dairy Farms in India, by K. P. R. Kartha.

Miscellaneous Bulletin No. 19.—A Preliminary Annotated List of Fruit Pests of the North-West Frontier Province, by Hem Singh Pruthi, and H. N. Batra.

Miscellaneous Bulletin No. 20.—Report of an Enquiry into the Cultivation of Cloves in India, by A. K. Yegna Narayan Aiyer.

A complete list of the publications of the Council is given in Appendix VII.

(iv) *Supply of Publications.*—The following table shows the circulation figures for the Council's publications during the year under report:—

Name of periodical	Supplied as exchanges *	Sales	Distributed free
Agriculture and Livestock in India . .	446	251†	200
The Indian Journal of Agricultural Science.	456	160†	69
The Indian Journal of Veterinary Science and Animal Husbandry.	390	122†	63
Scientific Monographs	228	149	27
Miscellaneous Bulletins	245	223	44

* Including those supplied as exchanges by the Directors, Imperial Agricultural Research Institute, New Delhi and Imperial Veterinary Research Institute, Mukteswar.

† Permanent subscribers and average casual sales during the calendar year 1937.

The scheme of free interchange of publications among the agricultural and Veterinary Departments in India, organised by the Council in 1934, continued to function satisfactorily, about 150 copies of each of the three journals of the Council being distributed under this scheme. In addition, there were about 359 institutions in India and 446 abroad which

received one or other of the Council's publications either free or on exchange basis. The mailing list is analysed as follows:—

1. No. of exchange institutions in India*	290
2. No. of exchange institutions abroad*	436
(*a*) *British Empire*—	
Great Britain	88
Canada	11
Australia	21
New Zealand	7
Ceylon	7
South Africa	24
(*b*) Africa	11
(*c*) Russia	14
(*d*) Europe	66
(*e*) China	6
(*f*) Japan	16
(*g*) U. S. A.	79
(*h*) Other countries	86
3. Number of Scientific Institutions in India receiving free copies (other than as exchanges).	99
4. Number of Scientific Institutions abroad receiving free copies	10
5. Number of newspapers and periodicals in India receiving free copies.	97

* Include those of the Directors, Imperial Agricultural Research Institute, New Delhi and Imperial Veterinary Research Institute, Mukteswar.

In addition to these regular supplies, about 120 requests for stray copies were received from occasional applicants and these were complied with as far as possible, the majority of requests being met by the supply of 'separates'.

(v) *Editorial Committees and Referees.*—The non-official representatives on the Editorial Committee during the year were—Professor F. R. Bharucha, D.Sc., Professor of Botany, Royal Institute of Science, Bombay, and Dr. Burch H. Schneider, Ph.D., Professor of Animal Husbandry and Dairying, Allahabad Agricultural Institute, Allahabad. As in previous years, the Editorial Committee was greatly assisted by many honorary specialist referees in the examination of papers offered for publication. The number of such referees during the year was eighty and the Council takes this opportunity of acknowledging the valuable services rendered by them.

36. *Library.*—The Council's Library has hitherto been developed primarily as a reference library and a valuable collection of technical as well as popular literature has been accumulated. With the transfer of the Imperial Agricultural Research Institute Library to New Delhi, however, the need for pooling the resources of the Council and the Institute Libraries was felt and it was decided that the Council should concentrate upon the acquisition of books of general agricultural interest, while the Institute should collect books of a more technical and specialised

character. This principle has been kept in view during the year under report and special attention has been paid to strengthening the stock of statistical and economic publications.

The Library collection at present comprises 17,371 books and bound volumes of Journals, 11,071 bulletins and leaflets, 1,629 reprints and separates and 439 translations and abstracts of papers, making a total of 30,510 publications. Of this number 3,204 books and publications were required during the year; the new additions are as follows:—

Purchases	286
Exchanges	2,775
Gifts	143
Total	3,204

The number of exchange publications has increased to 2,775 against 2,011 last year. As usual the United States of America has been the most generous contributor, supplying 1,016 publications. The details of the exchanges are given in Appendix VIII.

The following back sets of periodicals were added:—

1. Annales des Epiphytes, Vol. I, 1913 to date.
2. Journal of the Chemical Society, 1928 to date.
3. British Chemical Abstracts, 1928 to date.
4. Scientific Reports from the Agricultural College of Norway, Vol. 11, 1931 to date.
5. Agricultural Gazette of New South Wales, 1932 to date.
6. Records of Indian Museum, 1932 to date.

The number of current periodicals reached the total of 339, exclusive of serials and annuals, of which a large number is received. This number consists of 123 purchased from the research funds of the Council, 208 received in exchange and the rest gratis.

A classified list of the important periodicals is given in Appendix IX.

Two half-yearly supplements of the printed catalogue and a classified list of reprints and pamphlets, comprising entries upto the end of 1936, were published during the year. A list of the Imperial Bureaux translations of foreign papers filled in the Council's Library for loan to research workers in India has been prepared and will go to the press shortly.

The card catalogue is also kept up-to-date and about 2,500 typed cards were added to the set.

The circulation of books has increased steadily and a loan of 2,168 books, 7,072 issues of periodicals and about 100 translations of foreign papers has been recorded during the year under review. Besides a large number of books and publications were consulted by visitors to the Library.

Greater attention has been paid to reference work and several lists of references to literature and bibliographies on special topics were supplied to research workers on request, and a large number of inquiries about bibliographical information has been attended to.

37. *Accounts.*—A statement of audited accounts of the Council for 1936-37 is given in Appendix X.

38. *Scientific and Technical Officers.*—A list of scientific and technical officers paid from the research grants of the Imperial Council of Agricultural Research as on the 31st March 1938 will be found in Appendix XI.

N. C. MEHTA,
Secretary.

GLOSSARY.

Aman paddy	Winter rice (sown at the end of the rains and harvested in November).
Arhar	(Cajanus Indicus).
Aus paddy	Early rice (sown with the early rains and harvested in August).
Ata	Whole-meal flour.
Bajra	Pearl millet (Pennietum typhoideum).
Barani	Crop or land unirrigated.
Beali paddy	A type of Aus or Autumn paddy grown in Orissa.
Boro	Summer rice (Bengal).
Chakki	A mill.
Cholam	Sorghum (*see* 'jwar' below).
Chopan soil	(A typical alkali soil of the Bombay Presidency).
Chutney	Pickle.
Copra	Coconut Kernel.
Dalva paddy	Summer paddy sown in low lying areas in December January and harvested in April-May.
Desi	Indigenous.
Dorsa soil	A heavier type of soil in the Central Provinces with about 48 per cent. of clay.
Fazli	A mango variety.
Gangai	A pest of the rice plant.
Ghee	Clarified butter.
Gosaba	An experimental station in Sunderbans (Bengal).
Guara	Cyamopsis psoralioides a Kharif Leguminous crop.
Gul (*see* "gur" below)	Jaggery.
Gundhi	Leptocorisa varicorius—an insect which attacks paddy flower.
Gur (or gul)	Unrefined Indian sugar, jaggery.
Jaman	(Engenia Jamhotona).
Juar (or Jwar)	Sorghum. (Andropogan Sorghum).
Juari Land	A land in which juar is grown.
Kachcha	Temporary, not permanent (opposite of *pucca*).
Kanji	Drained of liquid of boiled rice.
Khandsari	An open-pan boiler in sugar Industry.
Khapra	Calandra oryzae—a beetle.
Kharif	Crops sown at the beginning of the rains and reaped from October to December; also applied to the season.
Khesari	Lathyrus Sativa.
Loghu paddy	A species of Aus paddy.
Langra	A mango variety.
Manshuri type barley	Barley grown in Manshuri (a tract in Arabistan Persia).
Mung	Green gram (Phaseolus mungo).
Nigar	A practice of draining the land in paddy culti vation in Bihar.
Patnai rice	A name given by commerce to a certain type of rice grown chiefly in Bengal and Bihar.
Rab	Massecuite.

Rabaries	Cattle breeders.
Rabi	Crops sown in the autum and reaped at the end of the cold weather; also applied to the season.
Rai	Brassica Spp.
Raya	Brassica juncea.
Sanai	Crotolaria juncea.
Sann	Crotolaria juncea.
Santra	Orange.
Sarson	Brassica compestis var. Sarson.
Sathi rice	A course variety of rice the flowers of which are enclosed inside a sheath.
Sela rice	Partially roasted rice prepared for hulling.
Til	Sesamum.
Toria	Bramica Napus Var. dichoroma.
Urd	Phasoolirs mungo Vov. Roxbunghii.

APPENDIX I.

Imperial Council of Agricultural Research, Governing Body.

1. The Hon'ble Kunwar Sir Jagdish Prashad, K.C.S.I., C.I.E., O.B.E., Chairman, Imperial Council of Agricultural Research.
2. Sir Bryce C. Burt, C.I.E., M.B.E., I.A.S.,
3. The Hon'ble Minister for Agriculture, Madras Presidency.
4. The Hon'ble Minister for Agriculture, Bombay Presidency.
5. The Hon'ble Minister for Agriculture, Bengal Presidency.
6. The Hon'ble Minister for Agriculture, United Provinces.
7. The Hon'ble Minister for Agriculture, Punjab.
8. The Hon'ble Minister for Agriculture, Bihar.
9. The Hon'ble Minister for Agriculture, Central Provinces and Berar.
10. The Hon'ble Minister for Agriculture, Assam.
11. The Hon'ble Minister for Agriculture, North-West Frontier Province.
12. The Hon'ble Minister for Agriculture, Orissa.
13. The Hon'ble Minister for Agriculture, Sind.
14. The Revenue Member to the Government of H. E. H. the Nizam of Hyderabad.
15. The Member in charge of Agriculture, Mysore Executive Council.
16. The Member in charge of Agriculture, Baroda Executive Council, Baroda.
17. The Revenue Minister, Government of Jammu and Kashmir.
18. The Diwan of Cochin.
19. The Diwan of Travancore.
20. The Revenue Member, Bhopal State Council.
21. The Hon'ble Mr. Hosain Imam, Member, Council of State. Representative of the Council of State.
22. Pandit Sri Krishna Datta Paliwal, M.L.A. } Representatives of the Legislative Assembly.
23. Mr. Mohd. Azhar Ali, M.L.A. }
24. Mr. P. J. Kerr, M.R.C.V.S., I.V.S., Director, Civil Veterinary Department and Veterinary Adviser to the Government of Bengal, Calcutta. } Representatives of the Advisory Board.
25. Mr. P. H. Carpenter, Chief Scientific Officer, Indian Tea Association, }
26. Mr. Chunilal B. Mehta, Representative of the Federation of Indian Chambers of Commerce and Industry.
27. Mr. R. Scherer.—Representative of the Associated Chambers of Commerce of India.
28. Diwan Bahadur Sir T. Vijayaraghavacharya, K.B.E.

Imperial Council of Agricultural Research—Advisory Board.

1. The Vice-Chairman, Imperial Council of Agricultural Research.
2. The Agricultural Expert, Imperial Council of Agricultural Research.
3. The Animal Husbandry Expert, Imperial Council of Agricultural Research.
4. Mr. A. M. Livingstone, M.A., B.Sc., M.C., Agricultural Marketing Adviser to the Government of India.
5. The Director, Imperial Agricultural Research Institute.
6. The Director, Imperial Veterinary Research Institute, Muktesar.
7. The Director, Indian Institute of Science, Bangalore.
8. The Director of Agriculture, Madras.
9. The Director of Agriculture, Bombay Presidency.
10. The Director of Agriculture, Bengal.
11. The Director of Agriculture, United Provinces.

12. The Director of Agriculture, Punjab.
13. The Director of Agriculture, Bihar.
14. The Director of Agriculture, Central Provinces & Berar.
15. The Director of Agriculture, Assam.
16. The Director of Agriculture, North-West Frontier Province.
17. The Director of Development, Orissa.
18. The Director of Agriculture, Sind.
19. Mr. P. T. Saunders, O.B.E., M.R.C.V.S., I.V.S, Director of Veterinary Services, Madras.
20. Mr. E. S. Farbrother, M.R.C.V.S., I.V.S., Director of Veterinary Services, Bombay Presidency.
21. Mr. P. J. Kerr, M.R.C.V.S., I.V.S., Director, Civil Veterinary Department and Veterinary Adviser to the Government of Bengal.
22. Mr. T. J. Egan, I.V.S., Director, Civil Veterinary Department, United Provinces.
23. Captain V. W. F. Walker, M.C., M.R.C.V.S., I.V.S., Director of Veterinary Service, Punjab.
24. Major P. B. Riley, I.V.S., Director of Veterinary Services, Bihar.
25. The Director of Veterinary Services, Central Provinces and Berar.
26. Rai Sahib Srish Chandra Ghosh, G.B.V.C., Superintendent, Civil Veterinary Department, Assam.
27. Khan Sahib S.M.A. Shah, M.R.C.V.S., Superintendent, Civil Veterinary Department, North-West Frontier Province.
28. The Director of Veterinary Services, Sind.
29. The Director of Agriculture, H. E. H. the Nizam's Government, Hyderabad (Deccan).
30. The Director of Veterinary Department, H. E. H. the Nizam's Government, Hyderabad (Deccan).
31. The Director of Agriculture, Mysore State.
32. The Superintendent, Civil Veterinary Department, Mysore State.
33. The Commissioner of Agriculture, Baroda State.
34. The Deputy Director of Veterinary and Animal Husbandry Science, Baroda State.
35. The Director of Agriculture, Cochin State.
36. The Senior Veterinary Inspector, Cochin State.
37. The Director of Agriculture and Fisheries, Travancore.
38. The Director of Agriculture, Bhopal State, Bhopal.
39. The Revenue Secretary, Bhopal State.
40. The Director of Agriculture, Kashmir.
41. The Superintendent, Civil Veterinary Department, Kashmir.
42. Mr. A. M. Mustafa, Agricultural Officer, Baluchistan—Representative of Minor Administrations under the Government of India.
43. The Inspector General of Forests, Forest Research Institute, Dehra Dun—Representative of the Forest Research Institute, Dehra Dun.
44. Diwan Bahadur T. Raghaviah, C. S. I., Cathedral P. O., Graeme's Road, Madras. Representative of the Co-operative Movement
45. Colonel A. J. H. Russell, C.I.E., I.M.S., Public Health Commissioner with the Government of India.—Representative of the Indian Research Fund Association.
46. Professor C. N. Vakil, M.A., M.Sc., F.S.S., University Professor of Economics, Bombay University.
47. Mr. P. H. Carpenter, Chief Scientific Officer, Indian Tea Association, Tocklai Experimental Station, Cinnamara P. O. (Assam).—Representative of the Indian Tea Association and the United Planters' Association of South India.

48. J. C. Ghosh, D.Sc., Dacca University, Dacca.
49. Professor P. K. Parija, M.A. (Cantab)., Ravenshaw College, Cuttack.
50. Dr. L. K. Hyder, Ph.D., C.I.E., Professor of Economics, Muslim University, Aligarh.
51. Rao Bahadur Bhimbhai R. Naik, M.L.C., Sagrampura, Surat.—Representative of the Indian Central Cotton Committee.
52. The Director of Veterinary Services in India, Q. M. G.'s Branch, Army Headquarters, Simla.
53. The Central Publicity Officer, Indian State Railways.
54. The Director, Industrial Research Bureau.
55. Maulvi Sir Mohammed Yakub, Moradabad.
56. Dr. Nazir Ahmad, M.Sc., Ph.D. (Cantab.), Director, Technological Laboratory, Indian Central Cotton Committee, Matunga, Bombay.
57. Sir Chunilal V. Mehta, K.C.S.I., Neville House, Currimbhoy Road, Ballard Estate, Bombay.
58. Rao Bahadur M. Vaidyanathan, M.A., L.T., F.S.S., Statistician, Imperial Council of Agricultural Research.
59. Sardar Bahadur Sardar Datar Singh, Cattle and Dairy Farm, Montgomery.
60. Raja Jagannath Baksh Singh.

GOVERNMENT OF INDIA.

Imperial Council of Agricultural Research Department.

Hon'ble Member for the Imperial Council of Agricultural Research Department :—

The Hon'ble Kunwar Sir Jagdish Prashad, K.C.S.I., C.I.E., O.B.E.,

Sir Bryce C. Burt, C.I.E., M.B.E., B.Sc., I.A.S., officiating Vice-Chairman.

Mr. N. C. Mehta, B.A., Bar-at-Law, I.C.S., Secretary.

Col. Sir Arthur Olver, C.B., C.M.G., F.R.C.V.S., Animal Husbandry Expert.

Dr. W. Burns, D.Sc., I.A.S., officiating Agricultural Expert.

Mr. S. Dutt, I.C.S., Under Secretary.

Rai Bahadur R. L. Sethi, M.Sc., B.Sc.(Agri.) (Edin.), M.R.A.S., I.A.S., Assistant Agricultural Expert.

Mr. H. B. Shahi, M.Sc., M.R.C.V.S., D.T.V.M., Assistant Animal Husbandry Expert.

Mr. A. M. Livingstone, M.C., M.A., B.Sc., Marketing Expert, I.C.A.R., and Agricultural Marketing Adviser to the Government of India.

Mr. R. C. Srivastava, O.B.E., B.Sc., Director, Imperial Institute of Sugar Technology.

Khan Saheb Bazlul Karim, Superintendent.

Mr. P. M. Sundaram, B.A., Superintendent.

Mr. S. C. Sarkar, B.A., M.R.A.S., Superintendent.

Research side.

Rao Bahadur Y. Ramachandra Rao, M.A., F.E.S., Locust Research Entomologist.

Rao Bahadur M. Vaidyanathan, M.A., L.T., F.S.S., Statistician.

Mr. Ramji Das Kapur, M.A., Chief Economist.

APPENDIX II.

Composition of Rice Committee, 1938-39.

Personnel.

1. The Vice-Chairman, Imperial Council of Agricultural Research—Chairman, *ex-officio*.	
2. The Agricultural Expert, I. C. A. R.	
3. The Agricultural Marketing Adviser to the Government of India.	
4. The Economic Adviser to the Government of India.	
5. The Senior Marketing Officer (Rice).	
6. The Statistician, I. C. A. R.	
7-19. The Directors of Agriculture, Madras, Bombay, Bengal, United Provinces, Bihar, Central Provinces, Assam, Sind, Hyderabad, Mysore, Travancore and Cochin and the Commissioner of Agriculture, Baroda.	
20. A representative of the Government of Orissa	Director of Development, Orissa.
21. The Hon'ble Mr. Hossain Imam.	
22-29. Eight representatives of rice growers, one each from Madras, Bombay, Bengal, United Provinces, Bihar, Central Provinces, Assam and Orissa	*Madras.*—Mr. B. Venkataratnam, Chodavaram, East Godavari District. *Bombay.*—Mr. G. D. Vartak of Virar, District Thana. *Bengal.*—Babu Monmohan Singha Roy, Makalpur, District Hooghly. *United Provinces.*—Mr. Prayag Dhevaj Singh, B.A., LL.B., M.L.A., Deoria, Gorakhpur. *Bihar.*—Babu Jamuna Prasad Singh, M.L.A., Gaya. *Central Provinces.*—Pdt. W. B. Lakhe, B.A., Malguzar, Raipur. *Assam.*—Mr. Kashinath Saikia, Ex-M.L.C. Laitumkrah, Shillong. *Orissa.*—Mr. Sarangdhar Das, B.A., [Calf. U. S. A.], Chandni Chouk, Cuttack.
30. The Paddy Specialist, Madras.	
31. The Crop Botanist, Bombay.	
32. The Economic Botanist, Bengal.	
33. The Economic Botanist (Rice), United Provinces.	
34. The Rice Specialist, Bihar.	
35. The Officer-in-Charge, Rice Research Station, Central Provinces.	
36. The Paddy Specialist, Orissa.	
37-38. Two Professors of Economics (selection)	Prof. P. J. Thomas, Prof. of Indian Economics, Madras University. Dr. H. L. Dey, Prof. in the Department of Economics and Politics, Dacca University.

39. A representative of the Associated Chambers of Commerce . . .	Rai Upendralal Ray Bahadur, Parade Square, Chittagong.
40. A representative of the Federation of the Indian Chambers of Commerce and Industry	Mr. Ashutosh Bhattacharyya, 69-A, Chetla Road, P. O. Alipore, Calcutta.
41. One Wholesale Rice Merchant (selection)	Mr. N. Rangaswami Reddyar, Rice Merchant, Kuttalam, Tanjore District.
42 One Rice-Miller (selection) . .	Mr. Binoy Krishna Roy, Chetla Road, Calcutta.
43. Additional Rice Miller . . .	Mr. C. V. Padmanabha Ayyangar, Bheemanrampet, Mylapore, Madras.
44-45. Two Trade representatives, one each from Madras and Bengal .	*Madras.*—K. P. V. S. Mohamed Meera Rowther, Sahib Bahadur, Merchant and Agent, Negapatam. *Bengal.*—Mr. M. A. Ispahani, President Muslim Chamber of Commerce, Calcutta.
Secretary, Imperial Council of Agricultural Research, Secretary, *ex-officio*.	

APPENDIX III.

Rice Committee, Second Meeting, March 1938.

Serial No.	Brief Subject.	Recommendation.
1	Aetion taken on the recommendations of the First meeting, January 1937.	(i) The Chairman promised that a report could be circulated at every meeting of the Committee showing the progress made with crop cutting experiments in the provinces. (ii) It was agreed that the Council would get figures of rice exports separately for Burma and India for circulation. Also that an enquiry would be made into the causes of the fall of export of rice from Chittagong to Cochin.
2	Progress reports on rice research scheme 1936-37—	
	(*a*) Madras	Approved.
	(*b*) Bengal	The need for standardising the notation for recording field work was emphasised. It was also agreed that new varieties intended for export should be sent to the Bengal Chamber of Commerce for opinion before they were distributed to the cultivator.
	(*c*) United Provinces . .	Approved. The Chairman said that a medal would be announced for handling of agricultural produce in the near future and that bullock-driven rice hullers would be included in the list.
	(*d*) Burma	Approved.
	(*e*) Bihar	Report not received from Press. For consideration at the next meeting.
	(*f*) Central Provinces . .	Approved.
	(*g*) Assam	As there was a considerable amount of difficulty in understanding local vernacular terms, it was suggested that a glossary should be prepared and published along with the reports. Dr. Burns promised to include this item in the instructions for the preparation of schemes, annual reports and technical programmes.
	(*h*) Investigations on Gangai disease of paddy.	It was suggested that the next meeting of the Entomological Committee should consider this work.
	(*i*) & (*j*) Investigations on quality in rice.	Approved.
3	A (i) Replanning of manurial experiments, etc.	It was considered necessary that the Agricultural Expert and the Statistician should collect further information from the fertiliser firms and Agricultural Departments and on the basis of these devise more exactly the experiments for the rice season of (monsoon) 1939.
	A (ii) Note on split-plot and other designs.	Information.

Serial No.	Brief Subject.	Recommendation.
	A (iii) Analysis of the results of certain rice stations.	The members were requested to study these and to send up their remarks to the Agricultural Expert.
	B. Water requirements of rice .	Information.
	C. Yield—the need for sample surveys.	It was considered that this question concerned all crops and should be taken up later by a Special Committee.
4	Comparison of numbers of varieties under tests, etc.	It was suggested that the opinions expressed by the plant breeders on manurial trials should be kept in mind by the Agricultural Expert and Statistician when planning the new experiments for all stations.
5	Extensions of rice research schemes, future policies.	It was agreed that if the Council had got to reduce the money available for rice research schemes, the first charge on the money available should be the Senior Research Officers and competent Assistants. The following resolution was also carried :—" The Rice Committee recommended that the Governing Body of the Council should apply to the Government of India for more funds for rice research".
	B (i) United Provinces rice research scheme—proposals for extension.	Extension for a period of three years was recommended at a cost of about Rs. 47,721.
	B (ii) Central Provinces and Berar, rice research scheme extension.	Extension for a period of two years was recommended at a cost of about Rs. 13,400.
	B (iii) Extension of the scheme on " Quality " in crops with special reference to rice.	The extension was recommended for one year at a cost of Rs. 3,500 (round). It was also suggested that the programme should be sent to Dr. Aykroyd for criticisms and suggestions.
	B (iv) Extension of the scheme for research in deep water paddy in Assam.	It was agreed to recommend the extension of this scheme to the end of 1938-39. In the meantime a full report should be put up on the results obtained so far and the Government of Assam should be asked if it would provide the control tank.
6	(i) Travancore scheme for improvement of paddy.	The scheme was returned for more specific proposals.
	(ii) Scheme for rice research in the Chingleput District of Madras Presidency.	It was agreed that in the event of the Madras Government providing an experiment station in the Chingleput area, the Imperial Council of Agricultural Research might consider a scheme for the survey study of dry varieties and their cultivation.
	(iii) Research on rice in Kashmir .	It was decided to recommend the scheme and also to suggest that a sub-station at a lower level would be required in addition in order to make testing more useful to the rest of India. The scheme was approved subject to the proviso that the Kashmir Government met half the cost.
	(iv) Baroda paddy research scheme.	The scheme was recommended subject to the condition that the Baroda Government provided the full 50 per cent. contribution.

Serial No.	Brief Subject.	Recommendation.
7	Note on drawing up of schemes, technical programmes and annual reports.	Accepted.
8	(A) Maintenance of the purity of improved varieties of paddy under cultivation.	Referred to the Special Developmental Sub-Committee of the Advisory Board.
	(B) Investigations of the factors which govern quality in fine rices and the possibility of growing such rices in tracts other than those to which they originally belong without any deterioration in their quality.	Postponed for next meeting.
9	Note regarding effect of "Paris Green" on crops.	Recorded.
10	Note regarding cultivation of Boro paddy in the precarious tracts of Assam under irrigation by mechanical means.	Recorded.
11	Note regarding the necessity to ascertain the definite causes that contribute to breakage in hulling of paddy.	There was a full discussion.

APPENDIX IV.

Report of the Drafting Sub-Committee correlating the results of the Dry Farming Research Schemes, held at Simla, on the 9th and 10th September 1937.

(*a*) *Soil.*—(i) The Sub-Committee pointed out that careful descriptions, both physical and chemical of soil profiles should be given in one of the reports of all the stations. In the case of Raichur in the absence of Agricultural Chemist, the sub-committee recommended that the agricultural chemist, Hyderabad may be requested to take up this work.

(ii) *Mechanical analyses of soils.*—The sub-committee recommended that international soda method should be used in the case of soils containing large proportion of lime. In the case of other soils international ammonia method may be used.

(iii) *Chemical analyses.*—The sub-committee recommended that A. O. A. C. method which at present is being employed should be used. With regard to special work like base exchange the method should be left to the workers depending on the soil.

(iv) *Physical constants.*—Mr. Kanitkar agreed to gladly carry out determinations for few samples from each of the other stations for moisture equivalent by the centrifugal method.

(viii) *Percolation tests.*—Percolation tests in the laboratory being inadequate the sub-committee recommended that in such studies field observations should be obligatory and laboratory tests optional.

(ix) *Drainage.*—The Sub-Committee observed that losses by drainage being negligible in deep types of soils there was no particular necessity of carrying out these studies. The stations which are having lysimeters like Sholapur and Raichur may, however, carry on the experiments.

(*b*) *Plant Investigations.*—It was considered desirable that each station should carry out detailed physiological work on as small a number of crops as possible *e.g.*, Sorghum at Sholapur, Setaria at Hagari and Bajri and wheat at Rohtak. In the case of Rohtak studies in jowar which are already in progress may be continued for another year when position will be reviewed. This does not restrict the workers from carrying out investigations on other crops but these should be only of a preliminary nature. The data of these developmental studies should be collected in such a form that correlation with yield and meteorological factors is possible. It was also pointed out that in the method of multiple regression it was usually possible to use only about 6 important characters for intensive study. Recording of observations on a large number of characters and their correlation in the end with meteorological factors becomes unmanageable. Professor Mahalanobis advised restricting the number of characters. The sub-committee recommended that three years' data already obtained should be analysed with a view to pick up more important characters preferably not more than six for future studies. Professor Mahalanobis also advocated that methods of reduction of statistical data should be standardized and computation work should proceed simultaneously with observation. Further he pointed out that at each station weekly estimation of the expected crop should be entered as a routine procedure together with a short summary of reasons. These estimates should be prepared separately for both Kharif and Rabi crops and should be started from the date when there was a reasonable expectation of a full crop. These statistics may be made in terms of percentages of normal yields but the actual normal yields should be given in lbs. per acre. These weekly forecasts would be very useful in many ways.

For making observations on individual plants in physiological studies the Sub-Committee made the following recommendations :—

(i) *Height studies.*

(*a*) Twenty plants should be pulled out for measurement of heights and the dry weights minus the roots.

(*b*) Height of 24 plants selected independently at random on each occassion should be recorded.

(*c*) Not less than 48 marked plants (in order to ensure 25 marked plants being available at the final stage) should be measured at regular intervals weekly or fortnightly depending on the growth rate of the plant.

All readings of height should be taken in centimeters and measured to the nearest half of a centimeter. The measurement should be taken from the ground level up to the last leaf-sheath.

(ii) *Dry weights.*—These should be of steam oven to constant weights and not sun-dried. In dry weights all roots including adventitious roots should be omitted as in some cases they are difficult to be taken out from the ground. These weights should be total dry weights and weights of stem and leaves may be left to the discretion of workers.

(*b*) Number of green leaves to be recorded separately for each of the plants taken out for dry weight.

(*c*) For tillering plants, the number of tillers per plant should be recorded for each plant taken out for dry weight.

(iii) *Sampling technique for physiological studies.*—Plants should be selected from a block not less than one quarter of an acre. The block may be divided into four quadrants and one-fourth of the number of plants should be taken from each quadrant. The plants should be taken at random with the help of random numbers. Labelled plants also should be selected at random.

(iv) *Density of the crop.*

(*a*) Not less than two sampling units from each quadrant *i.e.*, not less than eight units from the whole block.

(*b*) Size of sampling unit to be fixed so as to include from 30 to 50 plants but the actual size of sampling unit should be kept the same for the same plant in the same station.

(*c*) The sampling units should be selected at random.

At the last stage the yield of the individual plant should also be noted. The readings should be taken at fortnightly or monthly intervals (depending on the crop).

(vi) & (vii). *Trial of eight juar strains and six seteria strains.*—The Sub-Committee recommended that (*a*) when flowering is over, height of 48 plants should be taken separately for each plant.

(*b*) forty-eight plants should be selected at random in the following way—24 from each of two plots and six plants from each quadrant of each plot. The final yield of grain and fodder should be recorded for each quadrant of the two plots separately.

The girth at second internode down from earhead should also be recorded at the same time of the same 48 plants.

(vi) *Rotations.*—The sub-committee pointed out that with regard to rotation the general principles which should be observed are :—

(*a*) After a certain number of years each type of rotation should occur the same number of times,

(*b*) the lay-out must be adequate and should be such that complete analysis both with regard to seasons and different types of rotations is possible. The sub-committee further suggested that the data from these rotations like *e.g.*, meteorological and physiological should be submitted to Professor Mahalanobis. Where sufficient land was available replications of fields *i.e.*, repetition of all the designs in the same year was desirable.

Statistical.—Professor Mahalanobis pointed out that it was desirable to start as early as possible the statistical analysis of the vast amount of material already collected. The Committee recommended that sample sheets of *meteorological data and growth records and rotation data* should be sent to Professor Mahalanobis through the Agricultural Expert and he could suggest standard form by each station.

2. For all determinations *e.g.*, agronomic, physical, soil and chemical analysis, various sources of error were considered, like errors of determination, sampling errors or field variations. It was considered desirable to estimate the error of determination preferably on at least ten samples in the case of soil moisture and on five samples in the case of soil nitrogen. Workers should see that the error of determination was kept at the desired level by doing duplicate check tests on about five per cent. of the routine analysis. If the error increases, the number of the check tests should be increased. This question should be reviewed in the light of further experience.

3. *Experimental error.*—It was pointed out that in many cases the critical difference in field experiments was very high—greater than one hundred or two hundred per cent.

If in any experiment the critical difference exceeds 20 per cent. and results are non-significant, attempts should be made to improve the accuracy, for which one or other of the following methods may be tried :—

(i) Increasing the number of replications either by keeping the same size of the plot and increasing the total area or by reducing the size of the plot.

(ii) Conducting uniformity trials and eliminating initial soil differences by the method of co-variance.

When the critical difference exceeds 40 or 50 per cent. and the results are non-significant, and accuracy cannot be improved by the methods above suggested or by improved Agricultural methods, the question of continuing the experiment as a laboratory experiment with more stringent controls should be seriously considered failing which the experiment may have to be abandoned. In special cases, where critical differences are large but significant differences are obtained, experiments may be continued until results are considered to be established

4. *Sampling, (a) For soil Moisture.*—Two samples from each plot—from spots selected at random from the three layers should be taken in all replicates of any series of experiments. The choice of the experiment for the type of sampling was to be left to the worker. These samples should be taken at fortnightly or monthly intervals according to the requirement of the experiment and preferably the same day or as expeditiously as possible. All determinations should be done on individual samples and not on composite samples. It was recommended that in the case of shallow soils sampling may be done for layers 0-3″, 3-9″ and 9-18″ while for deep soils regular sampling should be done for the layers 0-6″, 6-12″ and 12-24″. If sampling was done below 24″ it should be by steps of one foot.

(b) For nitrogen.—Samples should be taken from first two layers, *i.e.*, 0-6″ and 6-12″ for deep and 0-3″ and 3-9″ for shallow soils at intervals of not more than a month. Two samples should be taken from each sampling unit and analysis should be done separately for each sample.

Size and shape of the plots.—The sub-committee recommended that to make any further changes in size and shape of the plots it was desirable that three years data should be carefully reviewed and collated. The work should start immediately after two years data become available. The data after being worked out should be examined by the Statistician to the Council for further advice.

APPENDIX V.

Personnel of the Soil Science Committee.

1. The Vice-Chairman, Imperial Council of Agricultural Research—Chairman—*ex-officio.*
2. The Agricultural Expert, Imperial Council of Agricultural Research.
3. The Agricultural Chemist, United Provinces.
4. The Agricultural Chemist, Punjab.
5. The Agricultural Chemist, Bihar.
6. The Agricultural Chemist, Central Provinces.
7. The Agricultural Chemist, Sind.
8. The Deputy Director of Agriculture, Orissa.
9. Mr. A. P. Cliff, Secretary, Indian Central Jute Committee, Calcutta.
10. Rao Bahadur B. Viswanath, F. I. C., Offg. Director, Imperial Agricultural Research Institute, Delhi (*Soil Chemist*).
11. Dr. J. K. Bose, Soil Physicist, Sugarcane Research Scheme, Bombay—Deccan, (*Soil Physicist*).
12. Dr. P. G. Krishna, Agricultural Chemist to the Government of Hyderabad, Hyderabad, (*Soil Physicist*).
13. Dr. E. Mackenzie Taylor, M.B.E., Director, Irrigation Research, Punjab, (*Soil Physicist*).
14. Dr. J. C. Ghosh, D.Sc., Head of the Department of Chemistry, Dacca, University, (*Physical Chemist*).
15. Dr. J. N. Mukherjee, D.Sc., Kaira, Professor of Chemistry, Calcutta University.
16. Mr. P. H. Carpenter, Chief Scientific Officer, Indian Tea Association, Assam.
17. Dr. Nazir Ahmad, Director, Technological Laboratory, Indian Central Cotton Committee, Bombay.
18. Dr. J. K. Dubey, Director of Agriculture and State Chemist, Government of Bhopal.
19. Mr. R. G. Allan, Commissioner of Agriculture, Baroda.
20. Dr. Sri Krishna, Bio-Chemist, Forest Research Institute and College, Dehra Dun.

The Secretary, Imperial Council of Agricultural Research, Secretary, *ex-officio.*

APPENDIX VI.

SUGAR COMMITTEE.

(I) *Official Members.*

(a) *Central Officials.*

Chairman.—Vice-Chairman, Imperial Council of Agricultural Research, *ex-officio.*

Members.

1. Agricultural Expert, Imperial Council of Agricultural Research.
2. Director, Imperial Agricultural Research Institute.
3. Director, Imperial Institute of Sugar Technology.
4. Imperial Sugarcane Expert.

(b) *Provincial Agricultural Departments.*

United Provinces.

1. Director of Agriculture, United Provinces.
2. Economic Botanist in-charge of Sugarcane Work, United Provinces, Shahjahanpur.

Bihar.—Director of Agriculture, Bihar.

Punjab.—Khan Bahadur Fateh-ud-Din, B.A., M.R.A.S.(E), A.R.H.S., I.A.S., Deputy Director of Agriculture, Jullundur.

Bengal.—Mr. G. B. Pal, Agricultural Chemist to the Government of Bengal.

Madras.—Director of Agriculture, Madras.

(c) *Indian State Representative.*

Mysore.—Director of Agriculture, Mysore.

(II) *Non-Official Members.*

(a) *Sugarcane Growers' representatives.*

1. *United Provinces.*—Chaudhri Khushi Ram, B.A., LL.B., M.L.A., Vakil, Meerut City.
2. *Bihar.*—Mr. B. B. Varma, M.L.A. (Central), Shikarpur, P. O. Narkatiaganj (B. & N. W. Rly.), District Champaran.
3. *Punjab.*—Rai Bahadur Chaudhri Bans Gopal, Advocate, Karnal.

(b) *Sugar Manufacturers' Representatives.*

(i) *Indian Sugar Mills' Association.*

1. Lala Shri Ram, Daurala Sugar Works, 20-22, Curzon Road, New Delhi.
2. Mr. D. R. Narang, The Basti Sugar Mills Co. Ltd., Basti (B. N. W. R.).

(ii) *Indian Sugar Producers' Association.*

1. Dr. J. H. Haldane, Ph. D., F.I.C., Messrs. Begg Sutherland & Co., Ltd., Marhowrah P. O., District Saran.
2. Mr. F. A. Sherwani, The Neoli Sugar Factory, Soron, District Etah, U. P.

(iii) *West India.*

Mr. Walchand Hirachand, Bombay.

(iv) *Nominated Members.*

1. Lala Hari Raj Swarup, Rais and Sugar Factory Proprietor, Rambagh, Muzaffarnagar.
2. Seth Haji Abdula Harroon, M.L.A. (concern and Sugar Factory in Bihar).

(v) *Representative of South India Sugar Factories.*

Mr. Lalchand Hirachand, Phoenix Buildings, Ballard Estate, Fort, Bombay.

(c) *Khandsari Industry.*

Lala Har Sahai Gupta, Zamindar, Bilari (Moradabad), United Provinces.

(d) *Additional nominations made by the Central Government.*

1. Chaudhri Mukhtar Singh, Daurala Sugar Works.
2. Mr. Sarangdhar Dar.

3. Mr. J. F. Millar (Belapur Sugar Factory, Belapur), P. O. Harigaon, Ahmednagar.

(*e*) *Sugar Trade representatives.*

(*i*) *The Bombay Sugar Merchants' Association.*
Mr. Jagjiwan Ujamshi Mulji, 32, Apollo Street, Fort, Bombay.

(*ii*) *The Cawnpore Sugar Merchants' Association.*
Lala Panna Lall Sahib, C/o The Cawnpore Sugar Merchants' Association Collectorganj, Cawnpore.

Secretary, Imperial Council of Agricultural Research, Secretary *ex-officio*.

APPENDIX VII.

PUBLICATIONS OF THE IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH, INDIA

[Prices are inclusive of packing and Indian Postage]

1. Agriculture and Live-stock in India

ICAR. 1 — A bi-monthly journal of agriculture and animal husbandry for the general reader interested in agriculture or live-stock in India or the Tropics. (Established 1931. Published in January, March May, July, September and November. Prepayable subscription Rs. 6 or 9*s*. 9*d*. per annum. Price per part Rs. 2 or 3*s*. 6*d*.) Volume I to VII complete are available.

2. The Indian Journal of Agricultural Science

ICAR. 5 — A bi-monthly scientific journal of agriculture and the allied sciences mainly devoted to the publication of the results of original research and field experiments. (Established 1931. Published in February, April, June, August, October and December. Prepayable subscription Rs. 15 or 24*s*. per annum. Price per part Rs. 3 or 5*s*. 3*d*.) Volumes I to VII complete are available.

3. The Indian Journal of Veterinary Science and Animal Husbandry

ICAR. 6 — A quarterly journal for the publication of scientific matter relating to the health, nutrition and breeding of live-stock. (Established 1931. Published in March, June, September and December. Prepayable subscription Rs. 6 or 9*s*. 9*d*. Price per part Rs. 2 or 3*s*. 6*d*.) Volumes I to VII complete are available.

4. Scientific Monographs of the Imperial Council of Agricultural Research

ICAR. 10·1 — No. 1. The Fungi of India, By E. J. Butler, C.I.E., D.Sc., M.B., F.R.S. and G. R. Bisby, Ph. D. (1931). Price Rs. 6-12-0 or 11*s*.

ICAR. 10·2 — No. 2. Life-histories of Indian Microlepidoptera, Second Series: Alucitidæ (Peterophoridæ, Tortricina and Gelechiadæ), By T. Bainbrigge Fletcher, R.N., F.L.S., F.E.S., F.Z.S. (1932). Price Rs. 3-4-0 or 5*s*. 6*d*.

ICAR. 10·3 — No. 3. The Open Pan System of White-Sugar Manufacture, By R. C. Srivastava, B.Sc. (1935, 2nd edition.) Price Rs. 3-2-0 or 5*s*. 6*d*.

ICAR. 10·4 — No. 4. Life-histories of Indian Microlepidoptera: Consmopterygidæ to Neopseustidæ, By T. Bainbrigge Fletcher, R.N., F.L.S., F.E.S, F.Z.S. (1933). Price Rs. 4-8-0 or 7*s*. 6*d*.

ICAR. 10·5 — No. 5. The Bombay Grasses, By E. J. Blatter, S. J., Ph. D., F.L.S. and C. McCann, F.L.S. Illustrated by R. K. Bhide. (1935). Price Rs. 20-12-0 or 32*s*. 6*d*.

ICAR. 10·6 — No. 6. Helminth Parasites of the Domesticated Animals in India, By G. D. Bhalerao, M.Sc. (1935). Price Rs. 7-12-0 or 13*s*. 3*d*.

ICAR. 10·7 — No. 7. Influence of Manures on the Wilt Disease of *Cajanus indicus* Spreng and the Isolation of Types Resistant to the Disease, By W. McRæ, M.A., D.Sc. (Edin.), F.L.S. and F. J. F. Shaw, D.Sc. (Lond.), A.R.C.S., F.L.S. (1933). Price Rs. 2-4-0 or 4*s*. 3*d*.

ICAR. 10·8 — No. 8. The Silk Industry of Japan with Notes on Observations in the United States of America, England, France and Italy, By C. C. Ghosh, B.A., F.E.S. (1933). Price Rs. 4 or 6*s*. 9*d*.

ICAR. 10·9 No. 9. Mechanical Cultivation in India. A History of the Large scale Experiments carried out by Burmah-Shell Oil Storage and Distributing Company of India, Ltd., By C. P. G. Wade. (1935). Price Rs. 3-14-0 or 6*s*. 6*d*.

ICAR. 10·10 No. 10. The Spotted Boll-Worms of Cotton in South Gujarat, By B. P. Deshpande and N. T. Nadkarny, B.Ag. (1936). Price Rs. 5-14-0 or 9*s*. 6*d*.

ICAR. 10·11 No. 11. Investigations on the Course and Distribution of the Nerves supplying Levator anguli scapuli and Rhomboideus muscles and the formation of the Phrenic Nerve in the Ox, with Observations on certain Anatomical Deviations, By H. N. Chelva Ayyangar G.M.V.C. (1937). Price Rs. 4-10-0 or 7*s*. 9*d*.

ICAR. 10·12 No. 12. The Fungi of India, Supplement I. By B. P. Mundkur. (*In the Press.*)

5. Miscellaneous Bulletins of the Imperial Council of Agricultural Research

ICAR. 8·1 No. 1. List of Publications on Indian Entomology (1930), By the Imperial Entomologist, Pusa. (1934). Price As. 14 or 1*s*. 6*d*.

ICAR. 8·2 No. 2. List of Publications on Indian Entomology (1931), By the Imperial Entomologist, Pusa. (1934). Price As. 8 or 10*d*.

ICAR. 8·3 No. 3. List of Publications on Indian Entomology (1932), By the Imperial Entomologist, Pusa. (1934). Price As. 12 or 1*s*. 3*d*.

ICAR. 8·4 No. 4. Host Plant Index of Indo-Ceylonese Coccidæ, By S. Ramachandran, L.Ag. and T. V. Ramakrishna Ayyar, B.A., Ph.D., F.Z.S. (1934). Price Re. 1-10-0 or 2*s*. 9*d*.

ICAR. 8·5 No. 5. List of Publications on Indian Entomology (1933), compiled by the Imperial Entomologist, Pusa. (1935). Price As. 9 or 1*s*.

ICAR. 8·6 No. 6. Bee-keeping, By C. C. Ghosh, B.A., F.E.S. (3rd Edition.) (1936). Price Rs. 1-14-0 or 3*s*. 3*d*.

ICAR. 8·7 No. 7. List of Publications on Indian Entomology (1934), compiled by the Imperial Entomologist, Pusa. (1935). Price Re. 1-2-0 or 2*s*.

ICAR. 8·8 No. 8. Selected Clinical Articles, Part I, By G. K. Sharma, G.P.V.C. and R. L. Kaura, B.V.Sc., M.R.C.V.S. (1936). Price As. 8 or 10*d*.

ICAR. 8·9 No. 9. Statistical Methods and their Application to Agronomy: A bibliography, By K. K. Guha Roy. (1936). Price Rs. 2-2-0 or 4*s*.

ICAR. 8·10 No. 10. Diseases of Sugarcane and Methods for their Control, By L. S. Subramaniam. (1936). Price Re. 1 As. 14 or 3*s*. 3*d*.

ICAR. 8·11 No. 11. Tables of Standard Errors of Mendelian Ratios, compiled by Swarn Singh Purewal, M.S.c, Ph.D. (Cornell) and P. Krishna Rao, L. Ag. (1936). Price As. 12 or 1*s*. 3*d*.

ICAR. 8·12 No. 12. List of Publications on the Botany of Indian Crops, Part II, for the period 1928-32, By R. D. Bose. (1936). Price Rs. 3-6-0 or 6*s* 9*d*.

ICAR. 8·13 No. 13. Two New Statistical Tables based upon Fisher's '*t*', By M. Vaidyanathan. (1936). Price As. 6 or 8*d*.

ICAR. 8·14 No. 14. List of Publications on Indian Entomology (1935), compiled by the Imperial Entomologist, Pusa. (1937). Price Re. 1-4-0 or 2*s*.

CAR. 8·15 No. 15. Selected Clinical Articles, Part II, By G. K. Sharma, G.P.V.C., R. L. Kaura, B.V.Sc., M.R.C.V.S., S. Ganapathy Iyer, G.M.V.C., G. S. Khan, B.Sc. and S. Mangrulkar, M.Sc., M.R.C.V.S., D.T.V.M. (Edin.). (1937). Price Re. 1-4 or 2*s*.

CAR. 8·16 Indian Grazing Conditions and the Mineral Contents of some Indian Fodders by P. E. Lander, M.A., D.Sc., F.I.C., I.A.S. (1937). Price Rs. 3-14 or 6*s*. 9*d*.

ICAR. 8·17 A Brief Survey of some of the Important Breeds of Cattle in India by Col. Sir Arthur Olver, C.B., C.M.G., F.R.C.V.S., F.N.I. (1938). Price Rs. 2 or 3*s.* 6*d.*

ICAR. 8·18 Milk Records of Cattle in Approved Dairy Farms in India by K. P. R. Kartha. (*In the Press.*)

ICAR. 8·19 No. 19 A Preliminary Annotated List of the Fruit Pests of the North-West Frontier Province by Hem Singh Pruthi, M.Sc., Ph.D. (Cantab). F.N.I. and H. N. Bhatia, B.Sc., Assoc. I. A. R. I. (*In the Press.*)

ICAR. 8·20 Report of an Enquiry into the Cultivation of Cloves in India by A. K. Yegna Narayana Iyer, M.A. (Cantab.), Agri. Dip. (*In the Press.*)

ICAR. 8·21 Investigations on the Cold Storage of Mangoes by Dr. G. S. Cheema, Dr. D. V. Karmarkar and Mr. B. M. Joshi. (*In the Press.*)

6. Annual Report of the Imperial Council of Agricultural Research

ICAR. 12·31 Annual Report of the Imperial Council of Agricultural Research for the years 1929-30 and 1930-31. Price As. 12 or 1*s.* 3*d.*

ICAR. 12·32 Annual Report of the Imperial Council of Agricultural Research for the year 1931-32. Price As. 6 or 8*d.*

ICAR. 12·33 Annual Report of the Imperial Council of Agricultural Research for the year 1932-33. Price As. 6 or 8*d.* (Out of Stock.)

ICAR. 12·34 Annual Report of the Imperial Council of Agricultural Research for the year 1933-34. Price Re. 1-8-0 or 2*s.* 6*d.*

ICAR. 12·35 Annual Report of the Imperial Council of Agricultural Research for the year 1934-35. Price Re. 1 or 1*s.* 9*d.*

ICAR. 12·36 Annual Report of the Imperial Council of Agricultural Research for the year 1935-36. Price As. 14 or 1*s.* 6*d.*

ICAR. 12·37 Annual Report of the Imperial Council of Agricultural Research for the year 1936-37. Price Re. 1-2-0 or 2*s.*

7. Agriculture and Animal Husbandry in India (called Review of Agricultural Operations in India up to 1933)

ICAR. 9·29 Review of Agricultural Operations in India, 1928-29. Price Rs. 3-2-0 or 5*s.* 6*d.* (Out of stock.)

ICAR. 9·31 Review of Agricultural Operations in India, 1929-31. Price Rs. 5 or 8*s.* 3*d.*

ICAR. 9·33 Review of Agricultural Operations in India, 1931-33. Price Rs. 5-12-0 or 9*s.* 6*d.*

Agriculture and Animal Husbandry in India, 1933-34 and 1934-35—

ICAR. 13-1-35 Part I.—Crop Production. Price Rs. 4-14-0 or 8*s.*

ICAR. 13-2-35 Part II.—Animal Husbandry. Price Re. 1 or 1*s.* 9*d.*

ICAR. 13·36 Agriculture and Animal Husbandry in India, 1935-36. Price Rs. 4-10 or 7*s.* 9*d.*

8. Proceedings of the Board of Agriculture and Animal Husbandry

ICAR. 2 Proceedings of the First Meeting of the Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry held at New Delhi from the 20th to 23rd February 1933, with Appendices. Price Rs. 5-14-0 or 9*s.* 6*d.*

CAR. 3 Proceedings of the First Meeting of the Crops and Soils Wing of the Board of Agriculture and Animal Husbandry in India held at Delhi from the 25th February to the 2nd March 1935, with Appendices. Price Rs. 6 or 9*s.* 9*d.*

9. Miscellaneous Publications

VRI. 1 — A Description of the Imperial Institute of Veterinary Research, Mukteswar, and its Sub-station, the Imperial Veterinary Serum Institute Izatnagar, By F. Ware, F.R.C.V.S. Price Re. 1-4 or 2*s*.

ARI.T.187 — The Production of Cigarette Tobacco by Flue-curing, By F. J. F. Shaw C.I.E., D.Sc., A.R.C.S., F.L.S. and Klashi Ram. *Imp. Inst. Agri. Res. Pusa Bull,* No. 187. Reprinted (1935). Price Re. 1 or 1*s*. 9*d*.

ICAR. 16 — A Handbook of Statistics for use in Plant Breeding and Agricultural Problems, By F. J. F. Shaw, C.I.E., D.Sc., A.R.C.S., F.L.S. Price Rs. 4-6-0 or 7*s*. 3*d*.

ICAR. 7 — Report on the work of the Imperial Council of Agricultural Research in applying sciences to Crop production in India, By Sir John Russell, D.Sc., F.R.S. Price Rs. 1-14-0 or 3*s*. 3*d*.

ICAR. 18 — Report on the Development of the Cattle and Dairy Industries of India, By Norman C. Wright, M.A., D.Sc., Ph.D. Price Re. 1-8-0 or 2*s*. 6*d*.

Copies of the above publications can be had from :—

The Manager of Publications, Civil Lines, Delhi and from any of the Agents, a list of whom will be found on the inside page of the front cover.

Purchasers not residing in Asia, Africa and Australia should apply to the High Commissioner for India, India House, Aldwych, London. Prices include Indian postage and packing.

Note.—When indenting please give only the symbol preceding the name of the publication.

APPENDIX VIII.

Books and Publications received as Library exchanges.

Names of countries.	Number of books and publications, etc., received.	Number of periodicals received.
1. Afghanistan	..	1
2. Africa	147	6
3. Argentine	8	..
4. Australia	17	3
5. Belgium	17	2
6. Bolivia	3	..
7. Brazil	4	4
8. British Guiana	1	1
9. Canada	55	2
10. Ceylon	11	2
11. Czechoslovakia	..	1
12. China	7	2
13. Cyprus	8	1
14. Denmark	1	..
15. Dutch East Indies	10	2
16. Fiji	2	1
17. Finland	19	..
18. France	4	3
19. Germany	1	6
20. Great Britain	335	40
21. Holland	51	2
22. India—		
(*a*) Central and Local Governments	598	9
(*b*) Private bodies and States	156	61
23. Indo-China	..	1
24. International Institute of Agriculture, Rome	78	7
25. Italy	4	3
26. Japan	1	6
27. League of Nations	64	6
28. Malta	1	..
29. New Zealand	3	2
30. Norway	..	1
31. Palestine	4	..
32. Panama	82	..
33. Philippines	11	4
34. Romania	16	1
35. Russia	25	10
36. Straits Settlement and Federated Malay States	17	5
37. United States	1,016	7
38. West Indies	14	6
Total	2,775	208

APPENDIX IX.

List of Journals received in the Library, Imperial Council of Agricultural Research.

Agricultural Engineering.

1. AGRICULTURAL ENGINEERING. (1937—).
2. IMPLEMENT AND MACHINERY REVIEW (England). Vol. 55. (1930 —).

Agriculture.

3. AGRICOLTURA COLONIALE (Italy). Vol. 28. (1934 —).
4. AGRICULTURA SINICA (China). Vol. 1. (1934 —).
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APPENDIX X.

Annual Accounts for the year 1937-38 relating to the grant for research purposes.

RECEIPTS. PAYMENTS.

Head of account.	Receipts during the year.	Grant. Original.	Grant. Net.	Head of account.	Expenditure during the year.	Excess — or Saving + over net grant.	Remarks.
	Rs. A. P.	Rs.	Rs.		Rs. A. P.	Rs. A. P.	
1. Opening balance on 1st April 1937 .	59,100 4 11	2,000 500	2,000 510	1. Sugar Committee . . .	2,048 11 0	—48 11 0	Inconsiderable.
2. Grants from Central Government for research work—				2. Sugar Technologist Main office .	510 0 0	...	,,
		...	30	3. Sugar Cable Service . . .	27 7 10	+2 8 2	,,
(i) Annual recurring grant . .	5,00,000 0 0	5,600	4,350	4. Bureau of Sugar Standards . .	4,321 10 6	+28 5 6	,,
(ii) Grant for Sugar Research .	1,75,000 0 0	43,000	43,200	5. Establishment of Research and Testing station for the indigenous system of *gur* and Sugar manufacture by the Director, I. I. of S. T.	37,121 9 3	—6,078 6 9	,,
(iii) Grant for Marketing Scheme (Provincial Portion) . .	2,00,000 0 0						
(iv) Special Grant for research work from the Sugar Excise Fund	2,50,000 0 0	8,700	4,250	6. Manufacture of Cattle feed from molasses	4,181 11 0	+68 5 0	,,
(v) Grant for cold storage scheme	1,00,000 0 0	36,200	35,700	7. Appointment of the Chief Economist and staff in connection with the investigations into the cost of production of crops in the Principal Sugarcane and Cotton tracts in India	35,539 14 3	+160 1 9	
(vi) Grant for agricultural and veterinary survey in Coorg .	4,000 0 0						
3. Grants from Indian States—							
(i) Donation from Mysore Durbar . 10,000							
(ii) Donation from Baroda Durbar . 5,000							
(iii) Donation from Cochin Durbar . 5,000							
(iv) Donation from Travancore Durbar . . . 5,000	32,500 0 0	...	2,600	8. Investigation into the cost of production of crops in the principal sugarcane and cotton tracts in India—			
		...	600	(*a*) Madras	2,573 7 5	+26 8 7	,,
		3,600	1,330	(*b*) Bombay	566 0 0	+34 0 0	,,
(v) Donation from Bhopal Durbar . 2,500		2,600	2,400	(*c*) Bihar	1,325 0 0	+5 0 0	,,
		...	280	(*d*) Bengal	2,372 4 3	+27 11 9	,,
(vi) Donation from Kashmir Durbar 5,000		...	...	(*e*) United Provinces . .	272 1 6	+7 14 6	,,
		19,600	17,900	(*f*) Sind	16 8 0	—16 8 0	,,
4. Interest from Investments—				9. Grant for research on Mosaic and other cane diseases at I. A. R. I.	17,868 0 0	+32 0 0	,,
(i) Interest from 5 per cent loan of 1939-44. . . .	77,525 8 0	27,000	29,200	10. Establishment of Sugarcane station in Bihar and appointment of a Sugarcane Specialist . . .	29,198 6 0	+1 10 0	,,
(ii) Interest from fixed deposit, etc.	14,527 10 0	14,600	13,850	11. Establishment of a sub-section of the Coimbatore Imperial Sugar Station at Karnal . . .	13,833 7 5	+16 8 7	,,
(iii) Interest from 2½ per cent 1948-52 and 3½ per cent loan 1947-50 . . .	30,174 4 0	4,400	2,200	12. Grant to the Government of Mysore for breeding thick canes . .	2,200 0 0	...	,,

5. Miscellaneous Receipts—				2,300	2,300	13. Sugarcane seedling testing station at Dacca	2,250 0 0	+50 0 0	„
(i) Receipts from Sugar Cable Service	46 9 0		46,000	61,600	14. Sugarcane Research Station in the Bombay Deccan	61,517 15 3	+82 0 9	„
(ii) Receipts on account of levy of professional fees by the Sugar Technologist	346 14 6		7,900	7,600	15. Research on the genetics of sugarcane at the Imperial Cane breeding station, Coimbatore	7,601 0 0	—1 0 0	„
(iii) Receipts from the Bureau of Sugar Standards	4,998 7 6		24,400	17,700	16. Central Sugarcane Insect Pests Scheme	17,700 0 0	...	„
(iv) Receipts from the Empire Marketing Board in respect of moiety of expenditure payable for the Bengal and Burma Rice Research scheme	19,960 15 8		31,300 25,000	21,550 27,700	17. Research on Sugarcane in the Madras Presidency 18. Scheme for the establishment of a sugarcane research station for the Punjab	21,511 0 0 27,709 0 0	+39 0 0 ...	„ „
(v) Receipts from the Indian Central Cotton Committee in respect of moiety of expenditure payable for the scheme of "Investigation into the cost of production of crops in the principal sugarcane and cotton tracts of India"	20,650 0 0		17,800 8,300	19,850 4,250	19. Investigations into various problems of sugar industry in the United Provinces 20. Extension of Sugarcane work at the Jorhat Experimental station, Assam	19,823 10 6 4,250 0 0	+26 5 6 ...	„ „
(vi) Receipts on account of unspent balances of grants made by the Council to various provincial Governments, private persons and Universities	2,648 7 5		1,300	650	21. Grant to the Government of Bihar for investigations into the possibilities of manufacturing *Khandsari* Sugar by the Single pan method	650 0 0	...	„
(vii) Receipts realised by the various provincial Governments from the schemes financed from the funds of the Council	62,526 11 7		500	520	22. United Provinces Sugarcane seedlings scheme	520 0 0	...	„
(viii) Receipts on account of sale of sugar maps	290 15 0		7,200	2,300	23. Chemistry of Sugarcane scheme	2,300 0 0	...	„
(ix) Miscellaneous	2,118 8 8		2,200	2,200	24. Grant to the Government of Baroda for investigation of suitable types of cane for Gujrat	2,200 0 0	...	„
			21,500	1,800	25. North-West Frontier Province Sugarcane scheme	1,800 0 0	...	„
			6,000	6,000	26. Scheme for the utilization of bagasse for the paper and board industry	6,000 0 0	...	„
6. Debts and Remittances—								
(i) Refund of loans and advances to Council's servants	1,374 0 0							
(ii) Deposits and advances	3,176 0 0		2,500	850	27. Research on the structural anatomy of sugarcane	820 0 0	+30 0 0	„
(iii) Recoveries from the research staff on account of income tax and provident fund, etc.	4,594 2 0		5,000	5,000	28. Grant to H. E. H. the Nizam's Government for Sugarcane Research	5,000 0 0	...	„
			...	11,200	29. Scheme of research on Sugarcane beetles in Burma	11,200 0 0	...	„
Total receipts	15,65,559 6 3		78,000	77,500	30. Special staff for Locust research work with headquarters at Karachi	77,338 5 3	+161 10 9	„
Receipts on account of repayments of investments and re-investments	21,00,000 0 0		1,000	...	31. Locust Committee	...	...	„
			1,000	800	32. Central Locust Bureau	801 2 0	—1 2 0	„
			1,000	...	33. Fertilizer's Committee	...	...	„
GRAND TOTAL	36,65,559 6 3		19,000	20,900	34. Statistical Section of the Bureau of Agricultural Intelligence	20,865 1 4	+34 14 8	„

Head of account.	Receipts during the year.	Grant. Original.	Grant. Net.	Head of account.	Expenditure during the year.	Excess — or Saving + over net grant.	Remarks.
	Rs. A. P.	Rs.	Rs.		Rs. A. P.	Rs. A. P.	
		2,00,000	2,27,850	35. Provincial Marketing Scheme .	2,27,850 0 0	...	Inconsiderable.
		24,900	25,900	36. Botanical Sub-station at Pusa .	25,900 1 8	0 1 8	,,
		22,550	22,600	37. Agricultural Meteorology, Poona .	22,599 15 0	+0 1 0	,,
		6,400	6,400	38. Grant to the Government of the Punjab for Locust Control measures	6,400 0 0	...	,,
		4,400	3,900	39. Appointment of a Physical Assistant to the Staff of Agricultural Chemist, Bengal . . .	3,900 0 0	...	,,
		44,000	43,200	40. Grant to the Agra College, Agra, for investigation of Rusts of Wheat and Barley	43,174 8 0	+25 8 0	,,
				41. Co-ordinated schemes of Rice Research—			
		6,200	...	(a) Burma	...	...	,,
		13,600	12,750	(b) Central Provinces . . .	12,750 0 0	...	,,
		18,500	27,250	(c) Bihar	27,250 0 0	...	,,
		18,400	15,400	(d) Assam	15,363 3 9	+36 12 3	,,
		15,400	13,850	(e) Bengal	13,820 0 0	+30 0 0	,,
		24,300	24,300	(f) United Provinces . . .	24,268 14 0	+31 2 0	,,
		1,300	1,830	(g) Madras	1,811 14 5	+18 1 7	,,
		23,700	2,100	(h) Orissa	2,082 7 0	+17 9 0	,,
		4,600	4,600	42. Research work on potatoes in Madras	4,600 0 0	...	,,
		33,200	42,100	43. Grant to the Imperial Agricultural Research Institute for potatoe breeding research in Northern India	42,042 3 9	+57 12 3	,
		17,000	15,250	44. Bombay cold storage fruit scheme	15,204 8 3	+45 7 9	,
				45. Provincial schemes of Fruit Research—			
		11,000	20,700	(a) Madras	20,693 6 4	+6 9 8	,,
		8,000	7,900	(b) Bengal	7,900 0 0	...	,,
		27,300	23,900	(c) United Provinces . . .	23,900 0 0	...	,,
		2,700	2,550	(d) Punjab fruits and vegetable preservation . . .	2,510 0 0	+40 0 0	,,
		14,200	22,700	(e) Bihar	22,676 4 7	+23 11 5	,,
		9,200	4,600	(f) Assam	4,600 0 0	...	,,
		17,200	12,700	(g) Central Provinces . . .	12,700 0 0	...	,,
		10,800	10,900	(h) Punjab—citrus and grape vines	10,900 0 0	...	,,
		3,300	...	(i) North-West Frontier Provinces	...	...	,,

3,300	...	(*j*) Hyderabad	...	...		"
4,300	2,150	(*k*) Mysore	2,150 0 0	...		"
16,000	3,800	46. Fruit canning and preserving laboratory at Quetta	3,800 0 0	...		"
		47. Dry farming research schemes—				
29,800	30,550	(*a*) Bombay-Deccan	30,532 0 3	+17	15 9	"
19,000	14,200	(*b*) Ceded Districts of Madras	14,183 12 0	+16	4 0	"
21,500	16,750	(*c*) South East Punjab	16,750 0 0	...		"
10,400	7,800	(*d*) Hyderabad, Deccan	7,800 0 0	...		"
14,500	13,450	48. H. E. H. the Nizam's Government scheme for the improvement of the castor crop in India	13,425 0 0	+25	0 0	"
15,000	15,000	49. Financial assistance to the Oil Technological Section of the Harcourt Butler Technological Institute	15,000 0 0	...		"
		50. Malting and Brewing Test of Improved Barleys—				
1,800	800	(*a*) United Provinces	800 0 0	...		"
600	3,100	(*b*) Punjab	3,100 0 0	...		"
1,200	...	(*c*) Bihar	...	...		"
3,400	2,100	51. Chemistry of malting cholam, Madras	2,078 0 0	+22	0 0	"
18,000	15,350	52. Research in systematic cultivation of medicinal plants and study of food poisons by Colonel Chopra	15,303 7 9	+46	8 3	"
2,200	4,550	53. Investigation of India fish poisons and other forest products for their insecticidal properties in Mysore	4,523 4 0	+26	12 0	"
20,400	13,900	54. Tobacco research Guntur sub-station	13,900 0 0	...		"
24,000	18,700	55. San Jose scale survey in the Punjab which is needed to prevent the pest spreading to other parts of the Punjab, United Provinces and North-West Frontier Province	18,670 0 0	+30	0 0	"
22,300	22,300	56. Equipment of a wheat milling and baking laboratory at Lyallpur	22,300 0 0	...		"
		57. Oil seed research schemes—				
13,000	9,000	(*a*) Linseed—Central Provinces	9,000 0 0	...		"
3,200	3,200	(*b*) Linseed—Bengal	3,140 0 0	+60	0 0	"
8,600	7,700	(*c*) Rape and mustard—Punjab	7,700 0 0	...		"
11,400	7,100	(*d*) Groundnuts—Madras	7,100 0 0	...		"
4,000	...	58. Scheme of research on the microflora of kallar and alkaline soils in the Punjab	...	...		"
9,800	4,900	59. Travancore scheme of research on the diseases of the coconut palm in South India	4,900 0 0	...		"
7,000	...	60. Research at the Imperial Agricultural Research Institute on the cytology of Indian crop plants	...	...		"

Head of account.	Receipts during the year.	Grant. Original.	Grant. Net.	Head of account.	Expenditure during the year.	Excess — or Saving + over net grant.	Remarks.
	Rs. A. P.	Rs.	Rs.		Rs. A. P.	Rs. A. P.	
		23,300	11,650	61. Bombay scheme of research on the virus diseases of plants . .	11,650 0 0	...	Inconsi-derable.
		•		62. Sunn-hemp schemes—			
		700	700	(*a*) Madras	700 0 0	...	,,
		1,900	1,550	(*b*) Central Provinces . .	1,550 0 0	...	,,
		500	250	(*c*) Bihar	250 0 0	...	,,
		1,200	600	(*d*) Bombay	600 0 0	...	,,
		1,800	1,050	63. Bengal flax fibre scheme . .	1,035 0 0	+15 0 0	,,
		3,000	2,700	64. Research on the gangai pest of rice in the Central Provinces . .	2,700 0 0	...	,,
		1,000	500	65. United Provinces scheme for the supply of decorticated cotton seed cake for propaganda . .	500 0 0	...	,,
		...	5,000	66. Survey of various fruit growing tracts in Baluchistan to determine the distribution and status aspect of the codling moth and *spilonata ocellana*	5,000 0 0	...	,,
		10,000	10,300	67. Dacca University scheme of Agricultural Research . . .	10,290 0 0	+10 0 0	,,
		5,700	5,550	68. Prof. Mukherjee's scheme of research into properties of colloid soil constituents . . .	5,510 0 0	+40 0 0	,,
		7,500	8,700	69. Prof. Mahalanobis's scheme of investigation on experimental errors in field trials . . .	8,700 0 0	...	,,
		2,100	2,350	70. Investigation on the Organic Constituents of Indian soils by Prof. J. C. Ghosh	2,350 0 0	...	,,
		2,300	4,100	71. Extension of work on "Quality" in Crops by the Indian Institute of Science	4,055 0 0	+45 0 0	,,
		300	300	72. Prof. J. B. Seth's scheme for investigating an electric method of Hygrometry, Punjab . .	292 5 0	+7 11 0	,,
		2,200	2,500	73. Investigation for preparation of cheap synthetic manure from town refuse and waste materials by the Indian Institute of Science, Bangalore	2,500 0 0	...	,,
		25,000	11,600	74. Benares University Plant Physiology Scheme	11,600 0 0	...	,,
		3,100	3,300	75. Research on nitrogen loss in soils and nitrogen fixation in soils by Dr. N. N. Dhar . . .	3,269 8 0	+30 8 0	,,

		2,300	2,100	76. Research work on Plant Physiology by Dr. Boshi Sen . .	2,100	0	0	...			"
		3,800	3,800	77. Research in Agricultural Economics at the Gokhale Institute of Politics and Economics . .	3,790	0	0	+10	0	0	"
		...	6,100	78. Clove enquiry	6,024	3	0	+75	13	0	"
		...	16,850	79. Cinchona enquiry	16,329	6	3	+20	9	9	"
		13,500	13,600	80. Appointment of a physiological chemist to study animal nutrition problems at Dacca . .	13,600	0	0	...			"
		5,600	5,600	81. Dr. Slater's scheme of goat breeding, United Provinces . .	5,559	0	0	+41	0	0	"
		8,700	9,000	82. Extension of work on animal nutrition in the Madras Presidency .	9,000	0	0	...			"
		7,000	9,000	83. Investigation of Johne's diseases among cattle in Mysore . .	9,000	0	0	...			"
		3,000	...	84. Punjab Government scheme regarding investigation into the most suitable and economic methods of combating different types of parasitic infection in ruminants in the field . .	...			...			"
		14,000	13,050	85. Grant to the Central Provinces Government for investigation for vaccination of cattle against rinderpest	15,015	0	0	+35	0	0	"
		8,100	8,200	86. Appointment of a systematic protozoologist, I. V. R. I., Muktesar	8,200	0	0	...			"
		36,000	...	87. Revised scheme for carrying on research work in the Anand Creamory in the manufacture of products and bye-products of milk	...			...			"
				88. Appointment of Veterinary Investigation officers in—							
		1,600	9,200	(*a*) Hyderabad-Deccan . .	9,200	0	0	...			"
		3,200	9,650	(*b*) Bombay	9,614	12	0	+35	4	0	"
		8,400	8,300	(*c*) Bengal	8,300	0	0	...			"
		5,500	10,100	(*d*) Punjab	10,090	0	0	+10	0	0	"
		9,600	8,400	(*e*) Bihar	8,400	0	0	...			"
		9,500	9,500	(*f*) Central Provinces . .	9,490	0	0	+10	0	0	"
		9,800	10,100	(*g*) Madras	10,100	0	0	...			"
		9,400	9,500	(*h*) United Provinces . .	9,500	0	0	...			"
		9,100	8,650	(*i*) Assam	8,650	0	0	...			"
		8,100	8,200	(*j*) North-West Frontier Province	8,200	0	0	...			"
		8,600	7,600	(*k*) Sind and Ajmer . . .	7,600	0	0	...			"
		38,800	...	89. Scheme for investigation of Tuberculosis and Johne's disease. Imperial Veterinary Research Institute	...			...			"

Head of account.	Receipts during the year.	Grant. Original.	Grant. Net.	Head of account.	Expenditure during the year.	Excess — or Saving + over net grant.	Remarks.
	Rs. A. P.	Rs.	Rs.		Rs. A. P.	Rs. A. P.	
		9,200	...	90. Grant to the I. V. R. I., Muktesar, for the appointment of a research officer and staff for investigation into contagious abortion in cattle, goats and sheep	...	...	Inconsiderable.
		8,100	...	91. Grant to the I. V. R. I., Muktesar, for research into disease of poultry in Bengal	...	...	,,
		4,800	4,400	92. Scheme from the Government of Bihar on the analysis of foodstuffs for cattle	4,360 0 0	+40 0 0	,,
		4,000	4,000	93. Grant to the Government of the Punjab for investigation of indigenous sheep breeding	4,000 0 0	...	,,
		6,000	3,950	94. Grant to the Government of Bombay for a scheme of research in poultry husbandry to be conducted in the Bombay Presidency	3,943 0 0	+7 0 0	,,
		16,600	...	95. Feeding of cattle on departmental farms, United Provinces	...	...	,,
		1,800	1,800	96. Fresh water fishes schemes, Bengal	1,800 0 0	...	,,
		3,300	700	97. Improvement of poultry for table purposes (Punjab)	700 0 0	...	,,
		14,700	13,900	98. Bombay sheep breeding scheme	13,900 0 0	...	,,
		3,300	3,600	99. Enquiry into the helminthiasis of cattle, sheep and goats in the United Provinces	3,600 0 0	...	,,
		3,200	3,200	100. Research on warble flies	3,200 0 0	...	,,
		6,550	2,800	101. Establishment of pedigree herd books	2,800 0 0	...	,,
		...	2,200	102. Village Enquiry regarding cattle and the production and consumption of milk (Bihar, Central Provinces, United Provinces, Punjab, Bombay and Madras)	2,159 15 3	+40 0 9	,,
		4,400	4,400	103. Research on the composition of milk at the Allahabad Agricultural Institute	4,380 0 0	+20 0 0	,,
		8,900	8,900	104. All-India Animal Husbandry Bureau	8,854 9 0	+45 7 0	,,
		...	840	105. Deputation to the British Commonwealth Scientific Conference	836 4 5	+3 11 7	,,
		...	...	106. Deputation to 6th World Poultry Congress	0 0 4	—0 0 4	,,

		...	1,520	107. Deputation to 4th International Grassland Congress	1,515	7	8	+4	8	4	„
		...	1,450	108. Deputation to the 11th World Dairy Congress	1,437	1	9	+12	14	3	„
		2,400	3,600	109. Contribution to the International office of Epizootics, Paris	3,567	14	3	+32	1	9	„
		8,000	...	110. Imperial Mycological Institute, London	...			...			„
		13,000	14,150	111. International Institute of Agriculture, Rome	14,123	5	4	+26	10	8	„
		29,200	27,850	112. Imperial Agricultural Bureau, London	27,825	0	0	+25	0	0	„
		1,300	...	113. Imperial Institute of Entomology, London	...			...			„
		150	...	114. Contribution to the Tobacco Federation of the British Empire	...			...			„
		150	150	115. Contribution to the British Empire Organization, Coffee Section	140	0	0	+10	0	0	„
		500	500	116. Contribution to the Indian Academy of Sciences, Bangalore	500	0	0	...			„
		500	500	117. Contribution to the National Institute of Science, Calcutta	500	0	0	...			„
		500	500	118. Contribution to the National Academy of Sciences, Allahabad	500	0	0	...			„
		...	1,350	119. Grant for research work on the quality of Coffee under the Indian Coffee Market expansion Board	1,333	5	4	+16	10	8	„
		9,600	6,650	120. Books and Publications	6,611	3	3	+38	12	9	„
		9,000	7,550	121. T. A. of non-official members of the I. C. A. R.	7,545	9	0	+4	7	0	„
		10,000	8,150	122. Accounts and Audit	9,147	2	0	—997	2	0	„
		6,000	12,200	123. T. A. of visitors	12,184	6	0	+15	10	0	„
		1,000	520	124. Editorial Committee	503	6	0	+11	10	0	„
		2,000	2,000	125. Miscellaneous	2,850	7	11	850	7	11	„
		1,00,000	16,790	126. Grant for the development of refrigerated rail transport	16,760	0	0	+30	0	0	„
		...	28,500	127. Scheme for studying and supervising the work of grading stations for agricultural produce	28,500	0	0	...			„
		500	...	128. Award of a medal for improvement in Agriculture and Animal Husbandry	...			...			„
		20,900	25,850	129. Scientific Review of the Research Progress of the I. C. A. R.	25,818	6	6	+31	9	6	„
		...	4,310	130. Rent for Government accommodation	4,309	0	0	+1	0	0	„
		3,000	2,500	131. Loans and advances to Council's servants	2,500	0	0	...			„
		1,500	4,550	132. Deposits and advances repayable	4,587	0	0	—37	0	0	„
		2,500	4,600	133. Remittances of income tax, provident funds, etc.	4,604	13	0	—4	13	0	„
				Total expenditure	17,47,593	10	9				
				Investment and re-investment in fixed deposit	18,55,000	0	0				
				By balance	62,965	11	6				
				GRAND TOTAL	36,65,559	6	3				

	Amount. Rs. a. p.
II. Particulars of Advances outstanding at the end of the year—	
Particulars.	
1. Permanent advance with the Locust Research Entomologist	1,500 0 0
2. Permanent advance with the Director, Imperial Institute of Sugar Technology . .	200 0 0
3. Permanent advance with the Secretary, Imperial Council of Agricultural Research	250 0 0
Total .	1,950 0 0

	Face value. Rs.	Purchase value. Rs.	(Approximate market value on 31st March 1938).
III. Particulars of Securities, etc.—			
1. 5 per cent. loan of 1939-44 (Stock certificates kept with the Reserve Bank of India, Calcutta)	15,54,400	14,99,995 0 0	Rs. 16,16,576 (at Rs. 104 for Rs. 100).
2. 3½ per cent. loan of 1947-50 (kept with the Reserve Bank of India, Calcutta) . .	5,50,000	5,91,495 1 0	Rs. 5,83,000 (at Rs. 106 for Rs. 100).
3. 2½ per cent. loan of 1948-52 (kept with the Reserve Bank of India, Calcutta) . .	4,00,000	4,02,736 9 0	Rs. 4,01,000 (at Rs. 104¼ for Rs. 100).
4. Five fixed deposit receipts Nos. 3880 to 3884, dated 8th July 1937 for one year at 1½ per cent. for Rs. one lakh each . . .	5,00,000	5,00,000 0 0	
5. Four fixed deposit receipts Nos. 3948 to 3951, dated 22nd September 1937 for one year at 1½ per cent. for Rs. 50,000 each . .	2,00,000	2,00,000 0 0	
6. One fixed deposit receipt No. 3956, dated 29th September 1937 for one year at 1½ per cent.	1,00,000	1,00,000 0 0	
7. One fixed deposit receipt No. 4011, dated 26th February 1938 for one year at 1½ per cent.	1,30,000	1,30,000 0 0	
8. Two fixed deposit receipts Nos. 3937 and 3938, dated the 28th August 1937 bearing interest at ½ per cent. and repayable at a week's notice for Rs. 50,000 each . .	1,00,000	1,00,000 0 0	
9. One fixed deposit receipt No. 3996, dated 1st February 1938 bearing interest at ½ per cent. and repayable at a week's notice .	1,75,000	1,75,000 0 0	
10. Ten five-year post office cash certificates, dated 25th September 1935	10,000	8,625 0 0	

	Rs. a. p.
IV. Particulars of closing balance—	
1. Cash in current account with the Imperial Bank of India, Simla	54,547 14 5
Cash in current account with the Imperial Bank of India, New Delhi . . .	8,417 13 1
Total .	62,965 11 6

N. C. MEHTA,
Secretary,
Imperial Council of Agricultural Research.

The accounts have been examined and according to the best of my information, as a result of a test-audit of the books of the Imperial Council of Agricultural Research, and consideration of the explanations given, the accounts are correct, subject to the remarks made in my Report of 14th July 1938.

R. C. KHANNA,
Examiner,
Outside Audit Department.

APPENDIX XI.

List of Scientific and Technical Officers paid from the research grant of the Imperial Council of Agricultural Research as on 31st March 1938.

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
Imperial Institute of Sugar Technology.					
1. Bureau of Sugar Standards .	Chemist	Mr. N. C. Verma, B.Sc. A.H.B.T.I.	11th March 1935	By selection.	
2. Cattle Feed Scheme . .	Assistant Chemist . .	Mr. M. A. Ekambram, B.Sc. A. H. B. T. I.	...	.....	
3. Sugar Research and Testing Station (Bihari).	Chemist	Mr. K. C. Joshi, B.Sc. Dip. Tech.	...	.....	
Locust Research Scheme, I. C. A. R.	Locust Research Entomologist to the Imperial Council of Agricultural Research, Karachi.	Rao Bahadur Y. Ramchandra Rao, M.A., F.R.E.S.	13th December 1930.	On foreign service, lent by the Madras Agricultural Department.	
	Assistant Entomologist, Pasni.	Dr. M. L. Roonwal, Ph.D. .	6th November 1935.	Direct appointment.	
	Assistant Entomologist, Karachi.	Dr. S. Mukerji, D.Sc. . .	10th January 1936.	Direct appointment.	
	Locust Research Assistant, Barmer.	Mr. Des Raj Bhatia, M.Sc. .	2nd January 1931.	Through the Public Service Commission (India).	
	Locust Research Assistant, Pasni.	Mr. S. M. Taqi Ahsan, M.Sc.	28th March 1934	Direct appointment.	
	Locust Research Assistant, Ambagh.	Mr. R. N. Batra, M.Sc. . .	27th May 1935 .	Direct appointment.	
	Mekran Survey Assistant, Pasni.	Mr. Rashid Ahmed, B.Sc. Hons.	23rd August 1935	Direct appointment.	
	Biometrical Assistant, Karachi.	Mr. Ram Lal Gupta, M.Sc. .	10th October 1936	Direct appointment.	
Statistical—Field Experiment .	Statistician . . .	Rao Bahadur M. Vaidyanathan, M.A. L.T.	6th July 1930 .	Through the Public Service Commission (India).	
	Statistical Assistant . .	Mr. S. Subramania Iyer, M.A.	5th June 1933 .	Through the Public Service Commission (India).	
	Agricultural Assistant .	Mr. T. Krishna Murthy, B.Sc. (Ag.).	11th February 1935.	Through the Public Service Commission (India).	
Cost of Production . . .	Chief Economist . .	Mr. R. D. Kapur, M.A., B.Sc	18th July 1932 .	Through the Public Service Commission (India).	

Name of Scheme	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
Imperial Agricultural Research Institute, New Delhi.					
1. Botanical Sub-Station, Pusa	1. Superintendent . .	Mr. R. D. Bose, B.Sc.. .	15th May 1936. .	By transfer from the Botanical section of the Institute.	
	2. Assistant . . .	Sheikh Mohd. Umar, M.Sc. .	1st August 1936 .	By transfer from the Botanical section of the Institute.	
2. Sugarcane Sub-Station, Karnal.	1. Superintendent . .	Mr. G. V. James . .	16th April 1931 .	By promotion from the Department.	
	2. Technical Assistant .	Mr. T. R. Venkatraman, B.A.	2nd October 1936	By promotion from the Department.	
3. Scheme for research into Mosaic and other diseases of sugarcane, New Delhi.	1. Plant Pathologist .	Dr. B. L. Chona .	23rd March 1936	Through the Public Service Commission (India).	
	2. Assistant Sugarcane Mycologist.	Mr. L. S. Subramanium .	23rd June 1933 .	Through the Public Service Commission (India).	
	3. Research Assistant .	Mr. S. A. Rafay, M.Sc. .	17th October 1932.	Through the Public Service Commission (India).	
4. Scheme for research on Genetics of Sugarcane at the Imperial Cane Breeding Station, Coimbatore.	1. Geneticist . . .	Miss E. K. Janaki Ammal, M.A., M.Sc., D.Sc.	26th May 1934 .	Through the Public Service Commission (India).	
5. Scheme for Potato breeding in Northern India.	1. Assistant . . .	Mr. Pushkarnath, M.Sc. .	1st April 1935 .	By selection from postgraduate students at Pusa.	
	2. Assistant . . .	Mr. M. L. Khanna, B.Sc. .	1st August 1936 .	By selection from the list of candidates recommended by Principals of Agricultural Colleges.	
6. Tobacco Research Sub-station, Guntur.	1. Superintendent . .	Mr. Ch. V. Sarvaya, B.Sc. Assos. I. A. R. I.	7th August 1936	By transfer from the Madras Agri. Department after inviting applications by advertisement.	
	2. Assistant Entomologist	Mr. C. K. Samuel, B.Sc. .	10th August 1936	By transfer from the Entomological Section of the Institute after inviting applications by advertisement.	
7. Scheme for Research on Insect Pests of Sugarcane.	1. Assistant . . .	Mr. T. V. Venkatraman, M.Sc.	27th August 1936	Selected from the applications received for the posts of Assistants which had been advertised.	
	2. Assistant . . .	Mr. K. V. Rao., B.Sc. Assoc. I.A.R.I.	4th September 1936.	Selected from the applications received for the posts of Assistants which had been advertised.	
	3. Assistant . . .	Mr. Tazimul Haq, B.Sc., (Agri.).	5th March 1938 .	Selected from the applications received for the post which had been advertised.	

	4. Assistant . . .	Mr. K. Lakshmanan, B.Sc. (Ag.).	1st March 1937 .	Selected from the applications received for the posts of assistants which had been advertised. Appointed as Fieldman from 2nd September 1936 and promoted to the post of Assistant from 1st March 1937.
8. Scheme for Research on Chemistry of Sugarcane.	1. Assistant Sugarcane Chemist.	Mr. S. C. Chaudhuri, M. Sc.	7th March 1938 .	Through Federal Public Service Commission.
MADRAS.				
1. Research on Potatoes in the Madras Presidency.	Superintendent, Agl. Research Station, Nanjanad.	Mr. V. K. Subramanaia Mudaliar, L.Ag.	13th June 1933 .	Promoted from Madras Agricultural Subordinate Service Class I—Upper Subordinates.
2. (*a*) Sugarcane Research at Anakapalle.	Farm Manager . .	Mr. I. Sambasiva Rao, B.Sc. Ag.	19th June 1935 .	Transferred from the Department.
	Botany Assistant . .	Mr. P. Sitaramayya, B.Sc. Ag.	7th April 1937 .	Transferred from the Department.
(*b*) Sugarcane Research, Gudiyattam.	Farm Manager . .	Mr. P. S. H. Narayanaswami Nayudu, B.Sc. Ag.	30th July 1937 .	Transferred from the Department.
	Botany Assistant . .	Mr. S. Ramaswami Ayyar, B.Sc. Ag.	11th May 1933 .	Transferred from the Department.
	Farm Manager . .	Mr. C. Ekambaram, B.Sc. Ag., underwent training in Animal Husbandry and Dairying at Pusa.	16th June 1935 .	Transferred from the Department.
3. Dry Farming Scheme, Hagari	Superintendent, Dry Farming Station, Hagari.	Mr. C. Vijayaraghava Acharya, L.Ag.	14th April 1934 .	Transferred from the Department.
	Assistant in Plant Physiology.	Mr. V. Panduranga Rao, M.A. (Botany and Zoology), M.Sc. (Nebraska).	1st October 1935	Through the Public Service Commission, Madras.
	Assistants for Millets .	Mr. P. Seshadri Sarma, B.Sc. Ag.	7th May 1934 .	Transferred from the Department.
		Mr. P. Krishnaswami, B.Sc., Ag.	31st October 1936	Transferred from the Department.
	Assistants to Soil Physicist	Mr. A. Abdul Samad, B.A. (Physics and Chemistry) B.Sc. Ag.	7th May 1934 .	Transferred from the Department.
4. Fruit Research Station, Anantarajupet.	Superintendent . .	Mr. K. C. Naik, B.Ag (Bombay), M.Sc. (Bristol).	3rd Aug. 1935 .	Through the Public Service Commission.
	Farm Manager . .	Mr. M. Jivan Rao, B.Sc. Ag.	September 1937 .	Transferred from the Department.
5. Marketing Scheme .	Assistant Marketing Officers	Mr. S. N. Venkataramana Ayyar, B.A. (Physics and Chemistry), B.Sc. Ag., underwent Statistical training at Calcutta.	21st February 1935.	Transferred from the Department.
		Mr. K. W. Chakrapani Marar, L. Ag.	25th February 1935.	Promoted from the Department.
		Mr. M. P. Kunhikutty, L.Ag., underwent post-graduate course in Animal Husbandry and Dairying at Bangalore.	23rd February 1935.	Promoted from the Department.

Name of Scheme	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
Agricultural Schemes—contd.					
6. Animal Nutrition Scheme	Assistants . . .	Mr. Y. V. Narayana Ayyar, B.A. B.Sc. Ag.	19th June 1935 .	Transferred from the Department.	
		Mr. S. Varadarajan, B.Sc., Ag.	19th June 1935 .	Transferred from the Department.	
		Mr. K. M. Krishna Menon, B.Sc. Ag.	19th June 1935 .	Transferred from the Department.	
		Mr. C. Balasubrahmanyam, B.A., B.Sc.	16th September 1935.	Transferred from the Department.	
7. Scheme of Research on Groundnuts.	Superintendent, Agricultural Research Station, Tindivanam.	Mr. C. M. John, B.A. .	22nd January 1937.	Promoted from the Department.	
	Assistants . . .	Mr. C. R. Seshadri, B.A., B.Sc. Ag.	1st February 1937	Transferred from the Department.	
		Mr. M. Bhavani Shankar Rao, B.Sc. Ag.	22nd January 1937.	Transferred from the Department.	
Veterinary Diseases Investigation Scheme.	Veterinary Investigation Officer, Madras.	Mr. G. R. Viswanathan, Graduate, Madras Veterinary College.	13th April 1933 .	Transferred from the Department.	
BOMBAY.					
1. Investigation of diseases in livestock and their treatment.	Veterinary Investigation Officer, Bombay Presidency.	Mr. R. N. Naik, G.B.V.C. .	27th June 1932 .	Recruited through the Public Service Commission (India).	
2. Sugarcane Research Scheme for the Deccan, Padegaon.	Principal Agricultural Officer.	Rao Saheb B. P. Vagholkar, L.Ag. (Bom.).	6th June 1932 .	Deputed from the Bombay Agricultural Department.	
	Crop Physiologist . .	Dr. R. D. Rege, M.Sc. (Bom.), Ph. D. (London).	6th July 1932 .	Recruited through the Board of Selection appointed by the Government of Bombay.	
	Soil Physicist . . .	Dr. J. K. Basu, M.Sc. (Cal.), Ph. D. (Lond).	18th June 1932 .	Recruited through the Board of Selection appointed by the Government of Bombay.	
	Agricultural Overseers .	Mr. V. N. Apte, B.Ag. (Bom.)	18th December 1931.	Deputed from the Bombay Agricultural Department.	
		Mr. N. B. Patwardhan, B.Ag. (Bom.).	1st March 1932 .	Deputed from the Bombay Agricultural Department.	
		Mr. P. S. Kulkarni, B.Ag. (Bom.).	15th October 1932.	Deputed from the Bombay Agricultural Department.	
		Mr. P. B. Wagle, M.Ag. (Bom.).	1st March 1932 .	Deputed from the Bombay Agricultural Department.	
		Mr. S. K. Sannabhadti, B.Ag. (Bom.).	1st September 1935.	Deputed from the Bombay Agricultural Department.	

		Mr. S. S. Sirur, B.Ag. (Bom.).	5th August 1932.	Transferred from the scheme financed from the funds of the Indian Central Cotton Committee.
		Mr. V. D. Tagare, B.Ag. (Bom.), B.Sc. (Bom.).	13th August 1932	Recruited by the Director of Agriculture, Bombay Presidency.
3. Dry Farming Research Scheme.	Chief Investigator, Dry Farming Research Scheme, Sholapur.	Mr. N. V. Kanitkar, M Ag. B.Sc.	1st October 1933	Deputed from the Bombay Agricultural Department.
Main-centre, Sholapur .	Assistant Investigator, Dry Farming Research Scheme in charge of Soil Section.	Dr. V. N. Gokhale . .	23rd December 1936.	Deputed from the Bombay Agricultural Department.
	Senior Assistant in Charge of Plant Section.	Mr. R. B. Gode, M.Sc. .	18th October 1933	Transferred from the scheme financed from the funds of the Indian Central Cotton Committee.
	Superintendent, Dry Farming Research Scheme, Main-centre.	Mr. G. M. Bapat, M.Ag. .	1st October 1933	Deputed from the Bombay Agricultural Department.
	Senior Assistant in Plant Section.	Mr. D. H. Gokhale, M.Ag.	12th October 1933	Recruited by the Director of Agriculture, Bombay Presidency.
	Junior Assistant in Soil Section.	Mr. Y. S. Rane, B. Ag.	1st October 1933	Recruited by the Director of Agriculture, Bombay Presidency.
Sub-centre, Bijapur . .	Superintendent, Dry Farming Research Scheme, Sub-centre, Bijapur.	Mr. K. D. Gomaste, B. Ag. .	Do. .	Deputed from the Bombay Agricultural Department.
	Junior Assistant at Bijapur.	Mr. G. B. Badami, B. Ag. .	2nd October 1933.	Recruited by the Director of Agriculture, Bombay Presidency.
4. The Cold Storage Research Scheme.	Senior Research Assistant .	Dr. D. V. Karmarkar, M.Sc. (Bom.), Ph.D. (Bristol), A.I.I.Sc.	1st March 1934 .	Recruited by the Director of Agriculture, Bombay Presidency.
	Junior Research Assistant.	Mr. B. M. Joshi, M.Sc. . .	1st March 1934 .	Deputed from the Bombay Agricultural Department.
	Senior Mechanic . .	Mr. K. S. Kahlon . .	1st October 1937.	Promoted by the Director of Agriculture, Bombay Presidency, from the Junior Mechanic in the Scheme.
5. Scheme for improvement of marketing in India.	Assistant Marketing Officers	Mr. A. K. R. Kazi, B. Bg., B. Sc., (Edin), N.D.D., D.I.C.	1st September 1937.	Deputed from the Bombay Agricultural Department.
		Mr. N. V. Bhagawt B. Ag. .	5th April 1935 .	Ditto.
		Mr. B. H. Patil B. Ag. .	8th July 1935 .	Ditto
		Mr. B. P. Deshpande, M. Ag. .	5th April 1935 .	Ditto.

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
BENGAL.					
1. Rice Research Scheme . .	Rice Research Officer .	Babu Suresh Chandra Chakravarty, B.Sc., I.Ag.	1st June 1932 .	Promoted from the Department.	
	Rice Research Officer .	Babu Kshitish Chandra Banerjee, B.A., L.Ag.	1st June 1932 .	Promoted from the Department.	
	Assistant . . .	Babu Jnan Ranjan Pal, B.Ag.	1st June 1932 .	Recruited by the Department.	
		Mr. E. A. R. Banerjee, M.Sc.	9th December 1932.	Recruited by the Department.	
2. Animal Nutrition Scheme .	Physiological Chemist .	Babu Indu Bhusan Chatterjee, L.Ag.	2nd January 1932.	Promoted from the Department.	
	Assistant Chemist . .	Mr. Md. Abdul Hai, M.Sc. .	2nd January 1932.	Recruited by the Department.	
3. Scheme for Physical and Chemical Research into soils.	Physical Assistant . .	Babu Manindra Nath Chakladar, M.Sc.	1st June 1932 .	Recruited through Public Service Commission (India).	
4. Scheme for establishing sugarcane seedling testing station in Bengal.	Field Assistant . .	Babu Surendra Nath Bhattacharjee.	22nd July 1935 .	Promoted from the Department.	
5. Horticultural Scheme in Bengal.	Horticultural Officer .	Mr. V. N. Vadhawkar, B.Ag.	9th April 1934 .	Recruited through the Public Service Commission (India).	
6. Scheme for economic enquiry into the cost of production of crops of the principal sugarcane and cotton tracts in India.	District Supervisor . .	Babu Benode Lal Mukherjee, B.Ag.	1st June 1936 .	Promoted from the Department.	Discharged with effect from 1st July 1937.
	Investigator . . .	Babu Santi Priya Bose, B.Sc. (Edin.)	11th September 1933.	Promoted from the Department.	
7. Scheme for Appointment of marketing staff in Bengal.	Senior Marketing Officer .	Mr. A. R. Malik, M.A., B.Sc. (Edin.)	7th February 1935	Promoted from the Department.	
	Assistant Marketing Officers:	Babu Hiron Kumar Basak, L.Ag.	25th July 1935 .	Promoted from the Department.	
		Babu Kshitish Chandra Guha, B.Sc. (Edin.)	5th August 1935 .	Promoted from the Department.	
		Babu Bhabesh Ch. Roy, L.Ag.	April 1936 .	Promoted from the Department	
		Moulvi Abdul Wahab Mollah, L.Ag.	20th July 1935 .	Promoted from the Department.	
8. Schemes for the Appointment of a Veterinary Investigation Officer in Bengal.	Veterinary Investigation Officer.	Mr. B. Singh, G. B. V. C. .	15th July 1936 .	Recruited by the Government of India, Department of Education, Health and Lands from the staff of the Imperial Veterinary Research Institute, Muktesar.	
9. Scheme for systematic cultivation of medicinal plants and study of food poisons	Botanist	Mr. R. L. Badhwar, M.Sc.	13th April 1935 .	Recruited by the Department.	
	Experimental Assistant Chemist.	Dr. N. N. Das, M.Sc., M.B.	13th April 1935 .	Recruited by the Department.	

	Compilers.	Mr. P. C. Khanna, M.Sc. .	5thOctober 1937	Recruited by the Department.	
		Mr. N. C. Goswami, M.Sc. .	1st October 1937	Recruited by the Department.	
		Mr. Shamlal Nayar, M.Sc. .	13th December 1937.	Recruited by the Department.	
10. Linseed Scheme . . .	Analytical Chemist . .	Dr. Sunil Behari Sen Gupta, M.Sc.	1st October 1937 .	Recruited by the Department.	
UNITED PROVINCES.					
1. Rice Research Scheme at Nagina.	Assistant Paddy Specialist.	Mr. T. R. Metha, B. Sc. (Pusa trained).	1st March 1932 .	Promoted	Offg. *vice* Dr. B. L. Sethi appointed as Economic Botanist (Cotton) to Government, U. P.
	Farm Superintendent .	B. Saniai Singh (2 year course Agri. College).	1st March 1935 .	Promoted from the Department .	
	Research Assistants . .	Mr. P. S. Gupta, M.Sc. .	13th August 1935	Direct appointment . .	
		Mr. R. K. Tandon, B.Sc., M. Sc.	3rd August 1936 .	Direct Appointment. . .	Offg. *vice* Mr. Mehta.
2. Research into the development of the fruit Industry in the hills in U. P.	Soil Chemist . . .	Mr. Narendra Kumar Das, M.Sc., Asso. I. A. R.I.	17th February 1938.	Recruited through the Federal Public Service Commission.	
	Horticulturist . . .	Mr. R. S. Singh, B.Sc. (Reading), L.Ag.	10th July 1934	Recruited through the Federal Public Service Commission.	
	Mycologist . . .	Mr. Udai Bhan Singh, M.Sc. .	10th July 1934		
	Entomologist . . .	Mr. Ram Narain Singh, L.Ag.	10th July 1934		
3. Investigation into the problem of the sugar industry in U. P	Assistant Entomologist .	Mr. G. D. Bhat, B.Ag. .	10th July 1934 .	Direct appointment.	
	Cane Physiologist . .	Dr. R. N. Mathur, M.Sc., Ph.D. (Agri.)	15th January 1934.	Direct appointment.	
	Chemical Assistant . .	Mr. Iqbaluddin Hyder, B.Sc. (Bristol), Ag.	27th July 1935		
	Research Assistant . .	Mr. D. C. Agarwal, L. Ag. (post-graduate, Pusa).	15th January 1934.	Promoted from the Department.	
	Entomologist . . .	Mr. B. D. Gupta, M.Sc. .	15th January 1934.	Direct appointment.	
	Cane Agronomist . .	Mr. Imdad Ali Khan, B.Sc. (Agri.) (Punjab).	14th December . 1934.	Recruited through the Federal Public Service Commission.	
4. U. P. Marketing Scheme .	Assistant Marketing Officers	Mr. P. L. Gaur, B. Sc. .	13th June 1935	Recruited through the Public Service Commission.	
		Mr. Shri Ram Singh . .	1st June 1935		
		Mr. Pati Ram Kala . .	5th June 1935:		
5. Dr. A. E. Slater's scheme of improvement of goats.	Assistant. . .	S. Sardar Singh Bhatia, I. D. D.	15th October 1931	Appointed by Dr. Slater.	

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through the Public Service, Commission etc.	Remarks.
BENGAL—*contd.*					
6. Appointment of Veterinary Investigation Officer in the United Provinces.	Veterinary Investigation Officer.	Mr. Harsh Bahadur Shahi, M.Sc., M. R. C. V. S., D.T.V.M.	4th April 1933 .	Direct appointment. . .	Was a State veterinary scholar of the United Provinces Government in the United Kingdom prior to his appointment as Veterinary Investigation Officer.
	Offg. Veterinary Investigation Officer.	Sardar Sahib S. Udam Singh, G. P. V. C. (Lahore).	25th November 1937.	Promoted from the Department.	On deputation to the Imperial Council of Agricultural Research.
7. Grant to H. B. Technological Institute, United Provinces, to maintain and run the Oil Section.	Head of the Oil Chemistry Section.	Mr. D. Y. Athawale, M.Sc.	24th September 1934.	Appointed by the Department.	The grant to the Oil Section of the Institute is Rs. 15,000 for 1937-38 to maintain and run the Oil Section. The deficit of pay to the staff and other contingent charges are met from the budget of the United Provinces grant.
	Lecturer in Oil Chemistry	Dr. N. G. Chatterji, D.Sc., D. I. C., A.I.C., A.M.I., Chem. E., LL.B	10th October 1919 and to the department 15th March 1921.		
	Assistant Research Chemist.	Mr. H. M. Mulany, M.Sc. .	3rd February 1922.		
PUNJAB.					
1 Sugarcane Research Scheme	Sugarcane Specialist .	S. Harbans Singh, B.Sc. (Agri.) (Punjab).	11th November 1934.	Promoted from the Department on the recommendations of the Public Service Commission.	

	Agricultural Assistants, A. Class.	Ch. Khushi Muhammad B.Sc. (Agri.)	13th December 1934.	Appointed by Director of Agriculture, Punjab, who is competent to make the appointment.
	Agricultural Assistant, A. Class.	Bh. Atam Singh Kochhar, B.Sc. (Agri.)	1st Febraury 1934	
	Agricultural Assistant, A. Class.	Bh. Dalbir Singh, B.Sc. (Agri.)	1st February 1934	
	Agricultural Assistant, A. Class.	Bh. Sardul Singh, B.Sc. (Agri.)	1st February 1934	
	Agricultural Assistant, A. Class.	Bh. Hardial Singh Guram, B.Sc. (Agri.)	21st August 1934	
2. Locust Research Scheme .	Agricultural Assistants, A. Class.	Mr. C. B. Mathur, M.Sc. (Zoology), Lucknow University.	2nd January 1931.	
	Agricultural Assistant, A. Class.	M. Abdul Haq, B.Sc., (Agri).	9th August 1933.	
3. Fruit and Vegetable Preservation Scheme.	Assistant Fruit Biochemist.	Dr. Girdhari Lal, B.Sc. (Pb.), Ph. D., D.I.C. (London).	8th November 1936.	Promoted from the Department by the Punjab Government.
	Junior Research Assistant	M. Mohammad Ishaq, B.Sc., (Agri.)	23rd April 1937 .	Appointed by Director of Agriculture, Punjab, who is competent to make the appointment.
4. Scheme for Improvement of Marketing in India.	Assistant Marketing Officer (Fruit).	S. Pritam Singh Diol, M.Sc. (Agri.) Mich. (U. S. A.).	15th March 1935 .	Promoted from the Department by the Punjab, Government.
	Assistant Marketing Officer (Livestock).	L. Harjas Rai, L.V.P. (Punjab).	15th March 1935 .	
	Assistant Marketing Officer (Oilseeds).	Ch. Zafar Alam, B.Sc. Agri. (Punjab), M.Sc. (London), F.L.S.	11th August 1935	
	Agricultural Assistant, A. Class.	Bh. Partap Singh, B.Sc., (Agri).	10th May 1937	Appointed by Director of Agriculture, Punjab who is competent to make the appointment.
5. Dry Farming Research Scheme.	Agriculturist . .	L. Tehl Ram . . .	1st July 1935 .	Promoted from the Department by the Punjab Government.
	Soil Physicist . . .	L. Sukh Dayal, M.Sc. (Pb.). .	1st July 1935 .	Promoted from the Department on the recommendations of the Public Service Commission.
	Plant Physiologist . .	Mr. I. M. Rao, M.A., M.Sc. (Madras).	14th March 1936 .	Recruited through the Federal Public Service Commission (India).
	Agricultural Assistant, A. Class.	M. Mohammad Afzal, B.Sc. (Agri.)	1st July 1935 .	Appointed by Director of Agriculture, Punjab, who is competent to make the appointment.
	Agricultural Assistant, A. Class.	L. Girdhari Lal . . .	1st July 1935 .	
	Agricultural Assistant, A. Class.	L. Lekh Raj Dhingra .	1st December 1937.	

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
PUNJAB—*contd.*					
6. Citrus Stock Scheme . .	Assistant Horticulturist .	Dr. Sahm Singh, B.Sc. (Agri.) (Pb.), Ph.D. (Bristol).	11th November 1936.	Promoted from the Department by the Punjab Government.	
7. Oilseeds Research Scheme .	Agricultural Assistant, A Class.	Mr. B. S. Mahangar, M.Sc.	18th August 1936	Appointed by Director of Agriculture, Punjab, who is competent to make the appointment.	
	Agricultural Assistant, A. Class.	Bh. Dayal Singh Johar, M.Sc.	1st October 1936		
	Agricultural Assistant, A. Class.	M. Sultan Ahmed, B.Sc. (Agri.).	1st November 1936.		
	Agricultural Assistant, A. Class.	L. Narsingh Dass, B.Sc. (Agri.)	16th August 1937		
8. San Jose Scale Scheme .	Agricultural Assistant, A. Class.	L. Asa Nand B.Sc. (Agri). .	3rd April 1937		
	Agricultural Assistant, A. Class.	M. Atiqur Rahman, M.Sc. (Agri.).	1st April 1937 .		
	Agricultural Assistants, A. class.	Bh. Harbans Singh, B.Sc. (Agri.).	5th April 1937 .		
9. Cold Storage Scheme . .	Agricultural Assistant, A. Class.	M. Abdul Hamid Khan, M.Sc.	14th March 1938		
10. Scheme for Poultry for table purposes.	Agricultural Assistant, A. Class.	L. Hari Krishan, B.Sc. (Agri.)	21st November 1937.		
11. Appointment of a Veterinary Investigation Officer in the Punjab.	Veterinary Investigation Officer.	Mr. S. M. Sarwar, M. R. C. V. S.	1st October 1932	Promoted from the department.	Upto 15th September 1937.
	Veterinary Investigation Officer.	Mr. Wali Mohd. Khan, B.Sc., M. R. C. V. S.	16th September 1937.	Appointed by the Imperial Council of Agricultural Research on the recommendations of the Punjab Government.	
12. Parasitological Research at the Punjab Veterinary College, Lahore.	Veterinary Assistant. .	L. Karam Chand, L. V. P. .	16th July 1934 .	Promoted from the Department.	Upto 15th October 1937.
13. Investigation of indigenous sheep breeding at the Government Cattle Farm, Hissar.	Veterinary Assistant Surgeon.	Bh. Gurbaksh Singh, L. V. P.	15th August 1936	Promoted from the Department.	
BIHAR.					
1. Rice Research Scheme* (extension sanctioned for 3 years from the 20th January 1932).	Rice Specialist .	Mr. M. Mahbub Alam, M.Sc. (Lucknow).	20th January 1932.	Deputed from the Bihar Agricultural Department.	Economic Botanist deputed to work as Rice Specialist from the 20th January 1932.

	Assistant Botanist .	Mr. A. Rashid Akhtar, M.Sc. (Punjab).	2nd April 1932 .	Appointed by Local Government.	*The scheme was first sanctioned for 5 years from 20th January 1932.
	Senior Research Assistant .	Mr. Awadh Bihari Saran, M.Sc. (Agra).	20th January 1937.		
	Senior Research Assistant.	Mr. M. Anwarul Aziz Khan, B.Sc. (Agra).	19th June 1937		
	Junior Research Assistant	Babu Rameswar Prasad M.Sc. (Agri.)Bot. (B.H.O.)	1st October 1937		
	Junior Research Assistant	Maulavi R. H. Naqui, B.Sc. (Agri.).	12th October 1937	Appointed by the Director of Agriculture, Bihar.	
	Fieldmen . .	Mr. H. C. Varma . .	16th July 1933 .		
		Mr. L. P. Sinha . .	1st June 1932 .		
		Mr. Leslie Jones, B.Sc.. .	31st January 1938		
	Senior Plant Collectors	Mr. M. Mohsin Akhtar .	1st March 1932 .		
		Babu Kapildeo Prasad Sinha, I.Sc. (Pat.).	7th February 1938		
	Junior Plant Collectors .	M. Shamsuddin . . .	1st June 1932 .		
		Babu Brijnandan Prasad .	21st March 1936 .		
2. Sugarcane Research Scheme† (extension sanctioned for 3 years from 18th March 1937).	Sugarcane Specialist .	Mr. K. L. Khanna, B.Sc., (Agri.) (Punjab).	18th March 1932 .		
	Physiological Assistant .	Mr. P. C. Raheja, M.Sc. (Agri.) (Punjab).	17th December 1933.	Recruited through the Public Service Commission (India).	†The Scheme was first sanctioned for 5 years from 18th March 1932.
	Chemical Assistant . .	Mr. Sailesh Chandra Sen, M.Sc.	23rd December 1933.		
	Botanical Assistants .	Mr. Rama Rao Panje, M.A. M.Sc. (Madras)	2nd January 1934		
		Mr. S. L. Sharma, M.Sc. .	6th November 1937.		
	Field Assistant . .	Mr. Prabhat Kumar Roy, M.Sc.	17th December 1935.		
	Overseer . . .	Babu Sudhansu Ch. Ghosh .	17th April 1934 .		
	Filedman . . .	Babu Jamuna Prasad Choudhury.	1st July 1937 .		
	Artist	Maulvi Saiyid Akhtar Hossain.	1st July 1937 .	Appointed by the Director of Agriculture.	
	Statistical Assistant . .	Mr. Guru Siddaya Mahadevaya Panchang, M.Sc (Lond.).	19th August 1937		
3. Fruit Research Scheme. (Sanctioned for 5 years from the 3rd April 1934).	Horticulturist . .	Mr. Zarbakht Khan, B.Sc., (Agri.) (Edin).	21st April 1935 .	Through the Public Service Commission (India).	
	Botanical Assistant . .	Mr. Provas Chandra Mallik M.Sc.	24th May 1937 .	Appointed by the Director of Agriculture.	
	Physiological Botanist .	Dr. Pabitra K. Sen . .	2nd September 1937.	Through the Public Service Commission (India).	
	Biochemical Assistant‡ .	Mr. Sheo Nath Prasad, M.Sc..	13th March 1935 .	Appointed by the Director of Agriculture with the consultation of the Provincial Selection Board.	‡Appointed to act as Assistant Agricultural Chemist from 1st April 1938.

Name of Scheme.	Name of post.	Name of officers and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
BIHAR—*contd.*					
4. Marketing Scheme, Bihar. (Sanctioned for 5 years from 13th March 1935).	Senior Marketing Officer .	(*a*) (*b*) Mr. B. N. Sarkar, L.Ag. (Sabour).	13th March 1935 .	Appointed by the local Government.	(*a*) Deputy Director of Agriculture, deputed to work as Senior Marketing Officer also holds charge of the Patna Range as Deputy Director of Agriculture in addition to his duties from 27th October 1937. (*b*) Paid by the Government of Bihar and Orissa.
	Junior Marketing Officers .	Mr. Promode Ranjan Hansdah Acharjee, M.A., B.Sc. (Michigan).	1st June 1935 .	Through the Public Service Commission (India).	
		Mr. Manilal Harinarayan Jani, B.Sc. (Edin.) N. D. D.	28th May 1935 .		
		Mr. Premchandra Verma, B.Sc., Ag.	24th May 1935 .		
5. Scheme for the analysis of indigenous fodders in Bihar. (Sanctioned for 5 years started from 1st October 1936).	Chemical Assistants . .	Babu Shiva Kumar Narayan, M.Sc. (Lucknow).	1st October 1936 .		
		Maulvi Zafar Ahmad,* M.Sc. (Pat.), A. H. B. T. I. (Cawnpore).	1st October 1936	Appointed by the Director of Agriculture.	*Appointed to act as Senior Scientific Assistant, Chemical Section, from 1st April 1938.
		Babu Thakur Prasad, M.Sc. (offg).	1st April 1938 .		
6. Sann-hemp scheme (Sanctioned for 3 years from 4th January 1938).	Assistant. . . .	M. Mohammad Fasihuddin, I.Sc.	4th January 1938	Appointed by the Director of Agriculture.	
CENTRAL PROVINCES AND BERAR.					
1. Investigation of animal diseases in the Province.	Veterinary Investigation Officer.	Mr. Bachan Singh, M.R.C.V.S.	20th June 1932 .	Recruited through the Public Service Commission.	

2. Vaccination of cattle against Rinderpest.	Senior Veterinary Assistant Surgeon.	Mr. G. D. Pani, G.M.V.C.	15th March 1935 .	Appointed from the Department.	
	Veterinary Assistant Surgeons.	Mr. P. S. Nair, G.V.S.C.	15th March 1935		
		Mr. C. G. Kurian, G.V.S.C.	15th March 1935		
		Mr. V. Srinivasan, B.A., G.M.V.C.	15th March 1935		
		Mr. B. N. Swamy, G.B.V.C.	21st March 1935	Fresh appointment.	
		Mr. Parameshwar Iyer, G.B.V.C.	10th November 1936.		
		Mr. M. P. Jhanek, G. M.V.C.	16th November 1936.		
		Mr. N. V. Dora Swamy, G.V.S.C.	10th October 193 .		
3. Scheme for the improvement of rice cultivation in the Central Provinces.	Botanist	Mr. B. B. Dave, L.Ag. . .	1st September 1932.	Selected from the Department by the Public Service Commission.	Holds charge of the scheme.
	Assistants	Mr. R. G. Joglekar, B.Ag. . Post Graduate, Pusa.	18th November 1932.	Recruited locally.	
		S. L. Vishnoi, B.Ag. .	23rd June 1933		
		Mr. H. P. Misra, B.Ag. .	18th November 1934.		
		Mr. S. N. Walkade, B.Ag.	29th July 1935		
4. Scheme for the improvement of Marketing in India.	Assistant Marketing Officers	Mr. A. X. Rebello, B.Ag. .	5th February 1935.	Seconded from the Department of Agriculture, Central Provinces.	
		Mr. R. N. Gadre, L.Ag. .	1st December 1937.		
		Mr. K. R. Dubey, B.Ag. .	8th November 1937.		
		Mr. R. P. Misra, G.B.V.C. .	15th February 1938.	Seconded from the Veterinary Department, Central Provinces.	
5. Scheme for the investigation of the Gangai Pest of Rice.	Entomological Assistant .	Mr. P. J. Deoras, M.Sc., LL.B.	21st July 1936 .	Recruited locally.	Termination on 20th July 1938.
6. Sann-hemp Research Scheme	Research Assistant . .	Mr. R. D. Mukerji, B.Ag.	11th January 1937.		
7. Oilseed Research Scheme .	Oil seed Specialist . .	Dr. R. H. Richharia, M.Sc., Ph.D. (Cantab.).	10th February 1937.	Recruited through the Public Service Commission.	
	Assistants . . .	Mr. D. P. Persai, B.Ag. .	5th July 1937 .	Recruited locally.	
		Mr. D. R. Dhodapkar, B.Ag.,	7th July 1937 .		
8. Central Provinces Citrus Fruit Research Scheme.	Horticulturist . .	Miss Rajul Raoji Bhai Shah, B.Ag., M.Sc. (Mich).	30th April 1937 .	Recruited through Public Service Commission.	
	Entomological Assistant	Mr. S. A. Raja Rao, M.Sc. .	3rd August 1937	Recruited locally.	
	Chemical Assistant . .	Mr. S. S. Kafallikar, B.Ag.	29th July 1937		
ASSAM.					
1. Investigation of animal diseases in Assam.	Veterinary Investigation Officer, Assam.	Pandit Gajanan Pande, M.Sc., M.R.C.V.S.	16th April 1933 .	Through the Public Service Commission (India).	
2. Sugarcane Research Scheme.	Chemical Assistant . .	Mr. Hemendra Nath Pal, M.Sc. (Chemistry).	3rd October 1933.	Appointed by the Director of Agriculture.	
	Assistant Manager . .	Mr. Bhubaneswar Das . .	1st November 1935.	Transferred from the Department.	

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
ASSAM.—*contd.*					
3. Agricultural Marketing Survey.	Senior Marketing Officer .	Mr. L. K. Hardique, B.Sc. (Edin).	13th February 1935	Promoted from the Department.	
	Assistant Marketing Officers	Mr. Narmad Kumar Das, L.Ag. (Hon.)	1st March 1935 .	Promoted from the Department.	
		Mr. Mashahid Ali, B.Ag. .	4th April 1935 .	Promoted from the Department.	
	Assistant Marketing Officer (Livestock).	Mr. A. Mohin Choudhury, B. Ag.	1st March 1938		Temporary for two months.
NORTH-WEST FRONTIER PROVINCE.					
1. Improvement of marketing in the North-West Frontier Province.	Assistant Marketing Officers	Ch. Ghulam Qadir, P. V. S.	10th May 1935 .	Direct appointment.	
		Mr. Supra, B.A., Economics .	1st May 1935 .	Direct appointment.	
2. (Veterinary) Scheme for investigation of disease.	Disease Investigation Officer	Mr. S. R. Chadda, B.Sc., M.R.C.V.S.	7th July 1935 .	Direct appointment.	
3. San Jose Scale Survey Scheme	Senior Entomologist .	Dr. Nazir Ahmad, M.Sc., (Zoology) D.I.C. (London.)	2nd December 1937.	Through the Federal Public Service Commission.	
ORISSA.					
1. Rice Research scheme (sanctioned for 3 years up to 31st March 1940).	Paddy specialist . .	Mr. P. D. Dixit, M.Sc. (Lucknow).	9th January 1938	Promoted from the post of the First Research Assistant and appointed through the Public Service Commission (India).	
	Physiological Assistant	Babu Jaganath Das, M.Sc. (Calcutta).	1st July 1937 .	Appointed by the Director of Development, Orissa and approved by the Imperial Council of Agricultural Research.	
	Research Assistants . .	Babu Goduri Vankata Chalun, M.Sc., (Benares Hindu University).	6th July 1937 .		
		Babu Trilokinath Shivapuri, M.Sc. (Lucknow).	31st July 1937 .		
	First Research Assistant .		Vacant.		
	Fieldman Overseer . .	Babu Dhruba Charan Mahanty.	20th January 1937	Appointed by the Director of Development, Orissa and approved by the Imperial Council of Agricultural Research.	
		Babu Harihar Misra, (B.Ag.)	31st July 1937 .		
		Babu Nandagiri Venkata Rao (B.Ag.).	4th August 1937 .		
		Mr. T. J. John, (B. Ag.) .	14th August 1937		
		Babu Prabhat Kumar Mukherji.	21st July 1937 .		
		Babu Artatrana Barik .	27th June 1937 .		

2. Bihar and Orissa Joint Marketing Scheme (Sanctioned up to 31st March 1940).	Junior Marketing Officer for Orissa.	Babu Madan Mohan Pradhan	16th September 1937.	Appointed by the Provincial Government.
SIND.				
Scheme for Improvement of Marketing, Sind.	Marketing Officer, Cereal Crops Group. Marketing Officer, Livestock Group. Marketing Officer, Special Crops Group.	Mr. K. H. Advani, M.Sc. (Tex) U.S.A. Dr. L. M. Hira, G. B. V. C. A., A. R. San. I. (London). Mr. Mahomed Bachal Memon, B. Ag. (Bombay).	20th May 1935 1st September 1935. 11th June 1935	Recruited through Public Service Commission.
HYDERABAD STATE.				
1. Dry Farming Research Scheme.	Superintendent . .	Mr. Shameem Zuhrie, B.Sc., C.D.A. (Glas.).	29th August 1936	Promoted from the Department.
	Senior Assistant . .	Mr. P. K. Savanur, B.Ag. .	4th July 1934	
2. Castor Research Scheme .	Technical Assistant .	Dr. L. G. Kulkarni, Ph.D. .	10th September 1935.	Fresh appointment.
	Assistant . . .	Mr. N. G. Masur, B.Ag. .	10th October 1935	Services obtained from the Bombay Government.
MYSORE STATE.				
1. Scheme for the Investigation of Fish Poisons and other Indian Forest Products.	Assistant Entomologist .	Mr. M. Puttarudriah, B.Sc. (Hons.).	20th December 1934.	
	Assistant Chemist . .	Mr. K. Lakshminarayana Bhatta, B.Sc.	20th December 1934.	
2. Sugarcane Research Scheme (Breeding of Thick Canes).	Senior Assistant Botanist .	Mr. B. Venkoba Rao, B.Sc.		
	Junior Assistant Botanist .	Mr. M. L. Subbanna, B.Sc. (Hons.).	1st February 1933	
3. Investigation of Johne's Disease Research Scheme.	Veterinary Inspector .	Mr. S. Srinivasamurthy, B.Sc., L.V.P.	21st January 1935	
4. Fruit Research Scheme .	Manager, Fruit Research, Station.	Mr. N. S. Iyengar . .		
BARODA STATE.				
Investigation of suitable types of canes in Gujarat.	Sugarcane Chemist . .	Mr. Kusumayudh Chunilal Desai, B.Ag.	16th November 1936.	Recruited through the State Service Committee.
TRAVANCORE.				
Scheme for the investigation of the root and leaf diseases of coconut palms.	Plant Pathologist . .	Dr. K. P. V. Menon, B.Sc., D.I.C. Ph.D. (London.)	8th March 1937 .	Direct appointment.
	Assistants to the Plant Pathologist.	Mr. U. Karunakaran Nair, B.A., B.Ag.	26th March 1937	Promoted from the Department.
		Mr. K. Madhusudanan Pandalai, B.A., M.Sc., A.I.C.	1st September 1937.	Direct appointment.

Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
CALCUTTA UNIVERSITY.					
1. Properties of Colloid Soil Constituents (Extended Scheme).	Senior Research Assistant	Mr. R. P. Mittra, M.Sc. (Cal.), First in Class I, in Chemistry in 1928 awarded University Gold Medal; Research Assistant under the old scheme.	1st November 1935.	Direct appointment.	
	Junior Research Assistant .	Mr. B. Chatterjee, M.Sc., (Cal.), in Chemistry (Class I); *vice* Mr. S. Mukerjee, M.Sc., resigned.	1st December 1937.	Direct appointment.	
2. Investigation of the Life-history, Bionomics and Development of Fresh Water fishes of Bengal.	Research Assistants . .	Mr. Motiranjan Das Gupta, M.Sc.	1st December 1936		
		Mr. Santosh Kumar Majumdar, M.Sc.	1st September 1937		
3. Statistical Studies and Training of Agricultural Officers in Statistics.	Teaching Assistant . .	Mr. S. S. Bose, M.Sc., P.R.S.	July 1931 . .	Appointed to the present post through the Federal Public Service Commission in June 1935.	
	Research Assistants .	Mr. R. C. Bose, M.A. . .	June 1935 . .		
		Mr. P. Roy, M .Sc. . .	February 1938 .	Appointed by the Syndicate, Calcutta University.	
DACCA UNIVERSITY.					
1. Dacca University scheme of research on the mechanical analysis of lateritic soils and on the nutrition of the rice plant.	Senior Assistant (Bio-Chemist). . .	Mr. P. K. De, M.Sc., A.I.I.Sc. (on study leave).	11th August 1930	Appointed through a Selection Board.	
	Assistant in Soil Chemistry	Mr. J. N. Chakravarty, M.Sc., Post Graduate Diploma, Pusa.	11th August 1930	Appointed through a Selection Board.	
	Junior Assistant . .	Mr. P. B. Bhattacharyya, M.Sc. (on leave). Mr. B. C. Kar, D.Sc., temporary.	1st December 1933	Appointed through a Selection Board.	
	Typist Assistant . .	Mr. Muhammad Hatem Ali; B.Sc.	11th November 1935.	Appointed through a Selection Board.	

2. Scheme for investigation on organic constituents of Indian Soils.	Research Assistant in Agricultural Chemistry.	Dr. A. C. Bose, Ph.D., A.I.C.	12th November 1934.	Appointed through Selection Board.	
AGRA UNIVERSITY.					
Investigation on "Cereal Rusts".	Senior Research Assistant	Mr. Raghubir Prasad Gupta, M.Sc. (Agra). Botany with special paper on parasitic Basidiomycetes. (including rusts).	11th April 1930 .	Direct appointment.	
	Research Assistants .	Mr. H. L. Gulatia, B.Sc., (Punjab); B.Sc., (Hons. Sch.) M.Sc., (Hons. Sch.) (Punjab)—Botany.	1st November 1931	Direct appointment.	
		Dr. B. M. Johri, M.Sc., (Agra); D.Sc. (Agra).	1st September 1937	Direct appointment.	
		Mr. J. L. Merh, M.Sc. (Allahabad).	10th May 1935 .	Direct appointment.	
	Junior Research Assistants	Mr. Ram Piyara Mal, B.Sc. (Ag.) (Punjab).	1st April 1933 .	Direct appointment.	
		Mr. T. B. Lal, B.Sc., (Ag.) (Allahabad) Assoc. I.A.R.I.	7th February 1938	Direct appointment.	
	Meteorological Assistant .	Mr. Gulab Chand Goyal, M.Sc. (Agra).	15th July 1935 .	Direct appointment.	
	Personal Research Assistant to Officer-in-Charge.	Mr. D. D. Gupta, B.Sc., Hons. Agric. (Wales).	16th December 1937.	Direct appointment.	
	Lecturer in Botany . .	Dr. R. P. Asthana, M.Sc. (Allahabad); Ph.D. (London); D.I.C. (London).	10th July 1936 .	Direct appointment.	
	Junior Research Assistant	Mr. H. R. Bhargava, M.Sc. (Agra)—Botany.	28th July 1937 .	Direct appointment.	
	Wheat Breeding Assistant.	Mr. S. Z. Hasanain, M.Sc., (Aligarh); —Botany; Assoc. I.A.R.I.	18th December 1937.	Direct appointment.	
	Assistant for Survey (Punjab).	Mr. Sikandar Lal Sehgal, B.Sc. (Agri.) (Punjab).	17th October 1936	Direct appointment.	
	Assistant for Survey (Bombay).	Mr. B. S. Varadarajan, B.Ag. (Bombay).	16th August 1935	Direct appointment	
	Assistant for Survey (Madras).	Mr. T. V. Pattabhiraman, B.Sc. (Ag.) (Madras).	10th October 1935	Direct appointment.	
UNIVERSITY OF MADRAS.					
Scheme of Research on Morphology and Anatomy of Sugarcane Sorghum Hybrids.	Assistant. . . .	Mr. K. R. Ramanathan, M.Sc.	...	.....	The work is carried on under the supervision and guidance of Dr. T. Ekambaram.

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or required through Public Service Commission, etc.	Remarks.
BENARES HINDU UNIVERSITY.					
Scheme of Research on the Physiology of cane and wheat.	Physiologist incharge of the scheme.	Professor B. N. Singh, D.Sc..	...	.....	Director of the Scheme.
	Assistant to relieve Professor B. N. Singh of part of his university work.	Mr. K. Kumar, M.Sc. . .	1st June 1937 .	Appointed by the Council, Benares Hindu University *vide* resolution No. 74 (*a*) 25th July 1937.	
	Senior Research Assistant	Dr. K. N. Lal, D.Sc. . .	1st June 1937 .	Appointed by the Council Benares Hindu University, *vide* resolution No. 69 (*a*) 24th July 1937.	
	Junior Research Assistant.	Mr. S. N. Singh, M.Sc. (Agric. Bot.).	1st June 1937 .	Appointed by the Council, Benares Hindu University *vide* resolution No. 69 (*b*) 24th July 1937.	
	Laboratory Assistant .	Mr. P. V. V. Seshagiri, M.Sc. (Agric. Bot.).	1st June 1937 .	Appointed by the Council, Benares Hindu University *vide* resolution No. 69 (*c*) 24th July 1937.	
LUCKNOW UNIVERSITY.					
Helminthiasis Scheme . .	Research Assistant . .	Dr. Bipin Bihari Sinha, D.Sc.	February 1937 .	Direct recruitment from the University of Lucknow.	The candidate was already at the University and was well qualified for the post.
ALLAHABAD UNIVERSITY					
Nitrogen loss from Soils and nitrogen fixation in Soils.	(1) Chemical Assistant	N. N. Biswas, M.Sc. . .	1st August 1936 .	Appointed by the Imperial Council of Agricultural Research on the recommendation of Professor N. R. Dhar.	These two officers have carried on work on nitrogen fixation and loss regularly and have obtained very important results from the practical as well as theoretical view points.
	(2) Bacteriological Assistant.	E. V. Seshacharyulu, M.Sc.	1st August 1936 .		
INDIAN INSTITUTE OF SCIENCE, BANGALORE.					
1. Extension of work on "Quality" of Corps.	Assistant Biochemist .	Dr. A. Sreenivasan, M.A., D.Sc., D. I. C.	...	.....	

2. Investigation for preparation of cheap synthetic manure from town refuse and waste materials.	Assistant Biochemist .	Dr. C. N. Acharya, M.Sc., Ph.D., A. I. C.	...	.....
ALLAHABAD AGRICULTURAL INSTITUTE.				
A Scheme for research on the composition of milk.	Assistant	Ishwar Das Dharni, B.Sc. (Hons.) M.Sc.	1st July 1936 .	Transferred from position as Teacher of Chemistry at Ewing Christian College.
		B. F. Agarwal, B.Sc. (Agr.) .	1st July 1936 .	Appointed direct, being available as he had just completed his B.Sc. (Agr.).
GOKHALE INSTITUTE OF POLITICS AND ECONOMICS, POONA.				
Scheme for Research in Agricultural Economics.	Director, Gokhale Institute of Politics and Economics.	D. R. Gadgil, M.A., M.Litt. (Cantab.).	1930 . . .	.....
	Senior Investigator . .	V. R. Gadgil, B.Ag. (Bom.), M.Sc. (Calif.).	1931 . . .	.....

APPENDIX XII.

Personnel of the Standing Central Fodder and Grazing Committee of the I. C. of A. R., as approved by the Governing Body at their meeting held in December 1937.

1. The Vice-Chairman, Imperial Council of Agricultural Research,—*Chairman.*
2. The Agricultural Expert, Imperial Council of Agricultural Research.
3. The Animal Husbandry Expert, Imperial Council of Agricultural Research.
4. The Director of Remounts, Army Headquarters (or a representative).
5. The Director of Farms, Army Headquarters (or a representative).
6. Mr. E. A. Smythies, Chief Conservator of Forests, U. P.
7. Dr. R. Maclagon Gorrie, Punjab Forest Department.
8. Professor L. S. S. Kumar, College of Agriculture, Poona.
9. The Inspector General of Forests, Forest Research Institute, Dehra Dun.
10. Dr. K. C. Sen, Officer-in-charge, Animal Nutrition Section, Izatnagar.
11. Mr. P. J. Kerr, Veterinary Adviser to the Government of Bengal.
12. Mr. V. S. Read, Assistant Superintendent (Fodder), Government Cattle Farm, Hissar.
13. The Parliamentary Secretary to the Hon'ble Minister for Agriculture and Rural Development, Madras.
14. Mr. C. C. Wilson, Conservator of Forests, Madras.
15. Mr. E. J. Bruen, Livestock Expert to the Government of Bombay.
16. Mr. E. A. H. Churchill, Principal, Agricultural College, Nagpur.
17. Mr. S. H. Howard, Conservator of Forests, United Provinces.

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Varadachary & Co., Madras, Messrs. P.
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Report of the Imperial Council of Agricultural Research for 1938-39.

CHAPTER I.

This is the ninth report of the Imperial Council of Agricultural Research and covers the period 1st April 1938 to 31st March 1939.

2. *Personnel of the Council.*—Sir Bryce Burt continued to officiate as Vice-Chairman and on the 31st March 1939 handed over charge to Mr. P. M. Kharegat, C.I.E., I.C.S., and proceeded on leave preparatory to retirement. Mr. N. C. Mehta relinquished charge of duties as Secretary on the 30th June 1938 and Mr. S. Dutt, I.C.S., officiated as Secretary from the 1st to the 17th July 1938. Mr. S. Basu, I.C.S., took over charge on the 18th July 1938.

Sir Arthur Olver relinquished charge of the post of Animal Husbandry Expert on the 25th May 1938 and was succeeded by Mr. F. Ware, C.I.E., I.V.S. From the 11th November 1938, Mr. Ware proceeded on leave and Mr. P. J. Kerr, I.V.S., Veterinary Adviser to the Government of Bengal, has since been officiating in that post. Dr. W. Burns, C.I.E., I.A.S., the Agricultural Expert was on leave from the 3rd June 1938 to the 15th September 1938 and during his absence Mr. H. R. Stewart, I.A.S., Director of Agriculture, Punjab, acted as Agricultural Expert. The composition of the Governing Body, the Advisory Board and the Secretariat of the Council at the end of the year is shown in Appendix I.

3. *Secretariat of the Council, change in status.*—The Secretariat of the Council, has from 1930 been a Department of the Government of India Secretariat under the Hon'ble Member in charge of Education, Health and Lands. In order to place the Council fully in the position which the Royal Commission of Agriculture envisaged and to enable it to carry out its primary functions with greater independence, the Governor-General in Council decided that with effect from the 15th January 1939, the Secretariat of the Council should cease to be a Department of the Government of India, connection with which will in future be through the Department of Education, Health and Lands. The designations of the Agricultural Expert and Animal Husbandry Expert have been changed to Agricultural Commissioner with the Government of India and the Animal Husbandry Commissioner with the Government of India.

4. *Indian States.*—The Hyderabad, Mysore, Baroda, Travancore, Cochin, Bhopal and Kashmir States continued to be constituent states of the Council.

5. *Meetings of the Council.*—The Advisory Board and the Governing Body met once during the year. The Annual General meeting of the Council was held on the 26th November 1938, when the Annual Reports on the working of the Council and on the accounts of the Council for 1937-38 were adopted.

6. *Finance and Accounts.*—The following grants were received during the year from the Government of India:—

	Rs.
(i) Annual recurring grant	5,00,000
(ii) Special grant for research work from the Sugar Excise fund	3,50,000
(iii) Grant for expenditure on the provincial portion of Marketing Scheme	2,00,000
(iv) Grant for Sugar Marketing Survey	1,200

The audited accounts for 1938-39 are given in Appendix II. Appendix III contains details of the expenditure incurred up to 31st March 1939 on the various research schemes financed by the Council.

7. *Scientific and Technical Officers.*—A list of Scientific and Technical Officers paid from the research grants of the Imperial Council of Agricultural Research as on 31st March 1938 will be found in Appendix XI.

8. *Agricultural and Veterinary needs of Coorg.*—With a view to ascertain the extent to which the Agricultural and Veterinary organisations in Coorg should be strengthened, the Government of India requested the Council to conduct an enquiry and placed at the disposal of the Council a sum of Rs. 4,000 for the purpose. Mr. A. K. Yegnanarayana Aiyar, retired Director of Agriculture, Mysore was appointed to make a survey of the Agricultural and Veterinary needs of Coorg. The enquiry lasted for about six months and was completed during the year under review. Mr. Aiyar's report is under consideration.

CHAPTER II.

RICE RESEARCH.

(i) *Standing Rice Committee.*—A list showing the composition of the Committee for the year 1938-39 is appended (Appendix IV). The question of its reconstitution for a further period of two years was considered by the Advisory Board in November 1938 and recommendations made for consideration by the Governing Body at its meeting in July 1939.

(ii) *Rice Research Schemes.*—The plan and scope of this important group of co-ordinated schemes have been stated in previous reports. Briefly, the object is to fill the lacunae which existed hitherto, to ensure more adequate attention to an important crop covering 80 million acres, and to secure a better interchange of information and material between workers in the different parts of India. Progress reports for 1937-38 from all the research stations were received during the year, and subjected to the usual criticism by appropriate sub-committees.

The schemes relating to the United Provinces, Central Provinces and Berar and Assam were renewed for further periods. A scheme for rice research in Kashmir has been approved as a part of the co-ordinated group of schemes and is awaiting allotment of funds.

A brief statement of the work in progress at the research stations during the year 1937-38 is given below:—

(*a*) Assam.

Habiganj.—The scheme started primarily for the improvement of *boro* and deep water *aman* completes its fourth year in 1937-38. In order to meet the growing demand for improved *aman* seed, three promising strains of deep water *aman* suited to three different levels of water have been given for distribution.

The rainfall during the season, was the lowest for several years, which was not favourable for the *boro* crop but the crop conditions for *aman*, were satisfactory.

Experiments on varietal response to submergence, and effect of age on submergence were continued. Experiments to study the relation of flood to factors such as method of broadcasting and seed rate were carried out. Cultural experiments in *boro* were being carried out on the same lines as last year. No significant difference was found between broadcasting and transplanting, showing the possibilities of broadcasting in pump-irrigated areas.

The rice research sub-committee which considered the report recommended *inter alia* that to cure the elongation of tillers in *boro* planting caused by foot rot, the seed treatment employed in Madras should be followed. It is also desired that the study of stem structure under different conditions of growth should be undertaken.

(*b*) Bengal.

(i) *Bankura (including suri).*—In this farm, experiments on varietal response to different situations, and broadcast *aus* tests and cultural experiments on dates of transplanting and ages of seedling, were continued. The results more or less confirmed the conclusions of previous years. The manurial experiments were in pots and confirm the findings of the previous

years that fertiliser manures applied up to the seventh or eighth week after transplanting gave the best yields.

(ii) *Chinsurah.*—At Chinsurah, the complex cultural experiment continued for the fifth time showed that the *first planting* (16th July) gave the highest yield. The experiment on age of seedling and date of planting showed the highest yield for the earlier plantings. Eleven weeks' old seedlings were found to be the best and, in the first planting, age of seedling did not make much difference.

(*c*) Bihar.

Sabour.—The improved strains evolved at this farm have yielded 20 to 30 per cent. higher yield than the standard varieties. These are also better in quality, are non-lodging and possess a high degree of adaptibility to diverse soil and climatic conditions of the province.

The investigations on the most suitable leguminous catch cropshows that none of the catch crops tried (gram, peas and *Khesari*) have any deleterious effect on the growth of the subsequent paddy crop and that these crops when grown will therefore bring an extra return to the cultivator.

The quantitative experiments on manures have yielded interesting results pointing to the advisability under Gaya conditions, of giving equal doses of both manures Nitrogen (N) and phosphorus (P) in combination, the best results being obtained with the maximum dose tried (60 lbs. N. *plus* 60 lbs. P_2O_5 per acre) which brings in a net profit of Rs. 35 to 40 per acre. Application of green manure (*dhaincha*) has more than doubled the yield, giving a net profit of Rs. 15 to 20 per acre. Addition of superphosphate enhances the yield still further.

Water requirement investigations have established the low transpiration rate of the drought resistant selections thereby showing their suitability for dry soil conditions.

The report for the year 1936-37 was examined by a technical subcommittee of the Advisory Board in November 1938. The investigations regarding variation in blooming time during the day, alteration of flowering time during the period of growth, the possibility of growing paddy in saline tracts and results of experiments on the practice of *Nigar* were noted as useful investigations.

(*d*) Central Provinces.

Raipur.—There are three main openings for the improvement of the rice crop in the Central Provinces. The first is to get a high-yielding fine rice, the second is to improve the yield of coarse rice and the third is to eradicate wild rice. The research work of the scheme has now reached the stage of showing practical results in each of these three lines.

Manurial experiments conducted for the last three years showed that the application of P_2O_5 at 20 lbs. per acre, in the form of superphosphate, was most economical and gave the largest net profit of Rs. 3-12-0 per acre. 20 lbs. P_2O_5 with 20 lbs. nitrogen in the form of ammonium sulphate also gave a net profit of Rs 2-14-0 per acre.

Important characters of *matasi*, *dorsa* and *kanhar* soils were discovered as the result of soil studies.

Investigations into the losses of valuable plant food through leaching from these different types of rice soils showed the following:—

(*a*) Owing to the heavier nature of the soil, quantities of the leachates obtained after different periods are strikingly lower in the case of *dorsa* soil than those obtained from the light *matasi* soil.

(*b*) Results of analysis of the soils before and after leaching for different periods indicated that the composition of the soil which was either untreated or treated with moderate doses of fertilisers was not appreciably altered as a result of leaching.

(*c*) Analysis of the various leachates, however, showed that in the case of both the soils there was a progressive increase in the amount of total solids lost as the period of leaching increased. Most of the nitrate nitrogen from the *matasi* soil was washed out in the first twentyfour hours, whereas there was a progressive increase in the amount of nitrate nitrogen lost from the *dorsa* soil as the period of leaching increased. Quantities of most of the constituents lost by leaching from the *dorsa* soil were strikingly lower than those lost from the *matasi* soil.

(*e*) ORISSA.

Cuttack (including Berhampore and Jeypore.)

The scheme started from the 1st July 1937. Work is being carried out in the main station at Cuttack and in two sub-stations at Berhampur and Jeypore.

Physiological work is carried out at the Ravenshaw College, Botanical Laboratory under the guidance of Professor Parija. The Anatomy of flood resistant paddy was undertaken. The flood resistant types showed a girdle of scherenchymatic tissue, not found in ordinary varieties, around each of the cortical lacunae. A similar structure was also present in an aquatic grass *Eragrostis interrupta*, whose anatomy was also studied. The work on pre-sowing treatment of grains with a view to inducing drought resistance in paddy was in progress.

The results of the treatment of winter paddy seeds with anaesthetics and high temperature with a view to shorten the dormancy period did not come up to expectation. On the other hand, the most successful and easy method of breaking the dormancy was found to be the smoking of seeds two hours daily for two or three successive days.

Selection work to find varieties to suit flood and saline conditions was in progress. The application of ammonium sulphate to broadcast late paddies at the time of beushaning and week before flowering has been found to be beneficial. Increasing doses of this fertilizer—(20 lbs. N. per acre to 40 lbs. N. per acre) have given increased yields but these do not pay for the cost of manure.

At Berhampore a number of selections has been made and attention was paid to early drought resistant types. At Jeypore the promising types at Cuttack and Berhampore are being tried.

(f) United Provinces.

Nagina.—The year under review, is the sixth year of the working of the Rice Research Station, Nagina. The scheme of experiments followed during the year was based upon the work done in the previous years. One important deviation has been the cutting out of the cytological work from the programme as suggested by the Rice Committee.

An elaborate scheme of testing varieties and hybrids under cultivators' conditions is in progress. Breeding work is being continued.

The agronomic programme was modified in the light of the results secured in the past years. The experiment on nitrogen and phosphoric acid ratios was abandoned. The effect of potash and lime were tried but negative results were obtained. The effect of ammonium sulphate (60 lbs. N.) was pronounced and was still more so when this quantity was applied in two or three doses as against a single dose. Green manuring with *sanai* (sann hemp) of nine or seven weeks' growth was more effective than *sanai* of five weeks' growth, and all the three treatments superior to no treatment. Molasses, applied either at the rate of 100 or 200 mds. per acre, gave a substantial increase in yield, but the time of application did not appear to matter much except in so far as an application just before transplantation was likely to damage the crop. Paris Green applied to kill mosquito larvae in the fields did not affect the rice yield.

(iii) Quality in Crops—Rice.

During the year under review the biological assay of vitamin B 1 and the calcium and phosphorous availabilities in Co. 9 Raw Rice were under investigation. The calcium in rice diet being low, experiments to supplement it by adding *Amaranthus gangeticus* (which contains a high percentage of calcium), were undertaken. Some of the experimental rats died after one or two weeks and the surviving rats were very rickety in appearance. The value obtained for the availability of calcium in *amaranthus gangeticus* was thus not found to be satisfactory. The experiment is being repeated.

In order to investigate the reason for the low availability of calcium in *Amaranthus* the oxalic acid content of the plant was also estimated. This was found to be present in a high percentage.

The factors responsible for the rancidity of the fat in storage of rice have also been under investigation. Rice was stored in bottles and the various constants of rice oil (saponification value, Iodine value, cooking quality) was examined at regular intervals of a month. The results obtained for two months do not show any change in these constituents.

Preliminary experiments carried out on the lipolytic activity of rice show that moisture increases this activity thereby leading to the deterioration in the quality of rice. Experiments to inhibit the lipolytic activity by selection of suitable substances, and elevation of temperature is in progress.

CHAPTER III.

WHEAT AND OTHER CEREALS RESEARCH.

(i) INVESTIGATION OF CEREAL RUSTS. (DR. K. C. MEHTA).

A brief statement of the important work done during 1937-38 is given below:

1. Further evidence of oversummering of rusts in the uredo-stage in the hills was obtained. Black rust was found to oversummer even at altitudes of 3,500—4,000 feet near Abbottabad (North-West Frontier Province). Black as well as brown rust broke out at Coimbatore as early as September 10th and 28th, respectively, in miniature plots sown during June-July.

2. Study of wind curves has again shown that winds from stations of earlier rust appearance passed over several places at least a fortnight before any infection was found on the local crops.

3. Survey of rusts was again undertaken in co-operation with the Professor of Botany, Lyallpur, the Plant Pathologist, Poona, and the Mycologist, Coimbatore, which again showed oversummering of all the three rusts of wheat at several places in the Punjab hills. In the plains, yellow rust was observed during February and brown and black in March-April. It might be mentioned that the appearance of yellow rust at some of the stations in the Punjab like Karnal, Gurdaspur and Lyallpur was reported in January and brown in February from Karnal.

No oversummering of rusts was observed during the year in the hills of the Bombay-Deccan. Black rust was observed at several places during January-February. Yellow and brown rusts were not reported from any station.

In the Nilgiris and Palni hills, as in previous years, rusts were found on the first crop (sown April-June) from July onwards and by the last week of August all the three rusts of wheat were observed in abundance (60—100 per cent. in some of the fields) in the Nilgris.

At Chitaldrug, (Mysore) black rust was observed early in December and it appeared in the miniature plot at Mandya on the 21st January.

The Council has under consideration certain methods for the control of epidemics of wheat in India as advocated by the officer-in-charge Rai Bahadur Dr. K. C. Mehta. These proposals have been referred for opinion to all the authorities concerned, both in British India and the Indian States. The matter will be finally considered by the Wheat Committee and the Advisory Board.

(ii) BREEDING OF RUST RESISTANT WHEATS.

As already stated in the previous reports the object of this scheme is to evolve wheat varieties (suitable for the hills) combining rust resistance with other economic qualities. It has been in progress since 1935 and an account of the work done during the first two years has already appeared in the previous report.

During the third year of operation (1937-38) the F 1 populations of a number of crosses made during the second year were tested for rust reaction, against a mixture of the six races of black rusts occurring in India. The seedlings of all the crosses proved to be highly susceptible, indicating that susceptibility is dominant to resistance.

Nine crosses in the F 3 generation were studied in detail. Out of a total of 4,521 plants, 1,631 proved to be resistant. Plants were selected for growing on to F4 on the basis of rust resistance and other desirable characters. Several new crosses were made between Indian varieties and resistant foreign varieties. The study of the 40 hill varieties collected in previous years was continued but none of them appeared to be promising for breeding purposes. Some more material was collected during the year. As in the previous year, a large number of exotic wheats continued to be under observation with the object of discovering varieties suitable for breeding work.

(iii) BARLEY.

Reference has already been made in the last annual report to the results of the tests of the 1936 crop of Indian barleys from the United Provinces, Punjab and Bihar, conducted at the Institute of Brewing, London.

During 1937, consignments were sent only from the United Provinces and the Punjab.

(a) *United Provinces Barleys.*

Thirty-two samples were sent. The valuers were very much impressed with barleys from *Raya* and with the malts made from them. Their appearance is so good that there should be no fear in sending barley of this type to England for brewing purposes.

The difficulty with the other barleys lies mainly in their appearance, which is different from that of the types now imported from other countries and appreciated by brewers. The malts from Kalianpur and, to a less degree, from the Kalai barleys, were judged to be a good brewing material. If the prejudice to the appearance of the barleys could be overcome, they should, therefore find a ready sale.

(b) *Punjab Barleys.*

Fifteen samples were sent from the Punjab, including two bulk consignments. As regards the small samples the following general remarks have been made by the Institute of Brewing:—

The barleys were placed in the following order from hand examination and appearance.

Type No. 4.—Gurgoan (Barani—Non-irrigation) and Gurgoan (Irrigation) would find a market in England.

Ferozepore (Irrigation), Ferozepur (Barani, Non-Irrigation) Rawalpindi (Barani, Non-Irrigation) and Lyallpur (Irrigation) were distinctly inferior in appearance to the others and would not find a market. The appearance of the malts were distinctly better than would have been expected from that type of barleys. They might find purchasers on the score of analysis and after the results of the brewing trials, now in progress, become known.

Brewers might replace Ouchak and Chilian types with this barley, particularly if it had the appearance of Gurgoan Barani (Non-Irrigation) and Bulk barley.

Type No. 5.—The differences were much less marked than with No. 4. This is of the type usually associated with Indian barleys exported from

Calcutta. It is not generally popular with brewers but distillers take it freely. These experiments tend to show that it is better for brewing than would be judged from its appearance.

Malts.—The analytical figures would induce many brewers to make trials with malts from No. 4 and No. 5, if their prejudice against the barley types could be overcome. No. 5 malts more readily than No. 4 and, at equal nitrogen content, gives a higher extract. The actual value of the malt on the basis of extract which is considerably greater than that of the Californian used as control, would not sell the barleys but might induce brewers to buy the malts. The barleys suffer in appearance in comparison with Californian which holds the field, but the malts give better analytical figures than Californian.

The two-rowed barleys were regarded as of no use to the British brewers. The six-rowed Winter barley was also very poor.

As regards the bulk barleys of Types 4 and 5, the general conclusions to be drawn from hand examination of the barleys and malts were that the barleys were only of average quality and would not prove attractive to the British brewers.

They malted well giving sound malting material of average class, distinctly more attractive than the barleys. The analyses were very good, the extract yield being particularly attractive.

The trial shipments of United Provinces barleys have been continued during 1938 and proposals for further continuance of widespread trials of selected types to determine the localities in which such barleys would develop their highest malting quality, are under consideration.

(iv) Chemistry of malting cholam.

This scheme was for a period of three years and terminated in 1938. The following are some of the important conclusions reached:—

(1) Whereas previously it has not been possible to preserve cholam malt flour for more than three months without deterioration. it has been found that malt can be kept packed in vacuum tins without deterioration or loss of aroma for at least six months. Storing of malted grain instead of as flour in air-tight glass jars would also preserve the aroma and prevent the formation of rancidity for a similar period. Storing as malted grain in vacuum tins would tend to enhance the keeping qualities and would be useful when malt flour is not in immediate demand.

(2) Under higher humidity, the keeping qualities of malt are lowered, during storage in containers which are not air-tight.

(3) Cholam malt being cheap, it can be utilized with benefit in the preparation of malt biscuits, malt cakes and malt bread for general use by adults in normal health.

(4) Blending of malt meals from two or more chosen cereals may be of use in the preparation of malted foods to contain very low fat content, so as to preserve longest and to contain protein at any desired level of nutrition.

The Animal Nutrition section of the Agricultural Chemist's Laboratory, Coimbatore, had undertaken studies of the relative digestibility of ordinary white bread made out of American flour and malt bread in which 25 per cent. of the flour had been replaced by cholam malt flour on albino rats. The digestibility of dry matter has been found to be equal in both cases

and the protein digestion appeared to be slightly in favour of white bread, but the matter requires further experimentation. For studies on human nutrition, experiments had been arranged to be conducted in collaboration with the Surgeon General with the Government of Madras. As a result of preliminary trial on infants under six months, the Director of the Nutrition Research Laboratories, Coonoor, thought that the cholam malt should prove useful as a supplementary food for infants. In the London Mission Hospital, Jammalamagudu (Cuddapah District), cholam malt has been used for invalids for eight years with successful results.

(v) Botanical Sub-Station, Pusa.

The work done under this scheme up to 1936-37 has been briefly stated in the previous reports. Yield trials on wheat, paddy and oats were continued in 1937-38. The deficiency of winter rains during the year and the consequent prolonged drought adversely affected the yield of most of the *rabi* crops. In preliminary varietal trials of 2-rowed as well as 6-rowed, hulled and hulless barleys, none of the types and hybrids out-yielded Pusa 21 type.

A three-factor complex cultural experiment with pigeon peas was laid out in a split-plot design to determine (1) the yielding capacity of five Pusa selections and three Pusa hybrids (2) the best spacing necessary for varieties with erect and spreading habits and (3) the best time of sowing. In the case of (1) it was found that there was no different response of erect or spreading varieties under trial as regards yield. As regards (2) it was observed that the closer the spacing the greater was the yield. As regards dates of sowing, the middle of June to the middle of July was found to be the best time.

Pusa Type 69 has been found to be perhaps one of the best Pusa strains in respect of taste.

Experiments to study the possibility of economising in the fuel supply of the flue curing of tobacco indicated that steam coal could be easily substituted in the stages of curing up to the 'fixing' stage by firewood or even with waste products such as dry leaves of *banyan* (*Ficus bengalensis*) and other trees. An experiment to study the effect of a mixture of fermented rape cake with leaf mould and farm yard manure did not show any good result.

CHAPTER IV.

FRUIT RESEARCH.

The reports of all the schemes for the year 1937-38 were received during the year under report. A sub-committee of the Advisory Board examined the reports as usual. The technical programmes of these stations were examined and renewals of certain current schemes were recommended. In addition, a special committee of the Board examined the question of the presentation of horticultural data in field experiments and prepared standard forms to be adopted by all horticultural stations. The following are some of the important recommendations of the Advisory Board on the subject of fruit schemes:—

(1) The provinces and states should be requested to supply a requisite number of printed copies of their report after the standard form circulated.

(2) In drawing up technical programmes of each station attention should be paid to the manufacture of fruit juices and fruit squashes and wherever possible, the work on fruits should be linked up with this growing industry.

(3) Since the Punjab Fruits and Vegetables Preservation scheme is rapidly developing into a central station for research on these subjects, the Punjab Government be requested to extend facilities for training in fruit and vegetable preservation and if feasible to admit students according to fixed quotas from other provinces.

Brief summaries of the work done at the several stations are given below:—

(i) Assam, 1938-39.

In 1936 the Council sanctioned a scheme for investigation into fruit cultivation in Assam. Owing to difficulties experienced in securing a suitable site, work could be started only in September 1938. A site was finally selected with the approval of the Agricultural Commissioner with the Government of India which is located at Badni on the Gauhati-Shillong Road. A tentative technical programme of work involving selection and manurial work was examined by the Advisory Board in November 1938 and approved.

(ii) Baluchistan—Fruit Canning and Preserving Laboratory, Quetta, 1938-39.

The Research Assistant, Dr. G. S. Siddappa, joined the scheme in April 1938. Machinery has been ordered and the laboratory is being built. A technical programme of work under the scheme for the year 1939-40 was received for consideration at the meeting of the Advisory Board in May 1939.

(iii) Bengal (Krishnagar), 1937-38.

The research work at this station was mainly on the following fruit crops:—mango, litchi, citrus, guava, papaya, pine-apple, banana and tomato. The experiments were mainly (1) varietal trials and (2) manurial, liming and cultural experiments.

Ten mango varieties from Murshidabad and two of the Krishnagar were planted for varietal trial. Propagation studies included the methods of budding, inarching, marcottage and the raising of seedlings.

Citrus canker disease though severe was brought under control by the spraying of Bordeaux mixture and adequate manuring of the plants. Marcottage gave good success in the case of guava.

The result of the pine-apple complex manurial and cultural experiment that was taken up in 1935-36 is now available, and it shows, that potash and phosphate when added singly act injuriously on the yield of the plants. The plants in the furrows failed completely owing to water-logging and those on the ridges gave as high as 60·6 per cent. of fruiting. In the hybridisation work the varieties were found to be normally seedless and it is doubtful whether crossing can be successfully undertaken here.

Of the various banana varieties tried, the Madras varieties were found useless, Roykola among the Saharanpur varieties was quite a success and those from Rampal (Dacca) excellent.

Last year's trial of tomatoes showed that Marliana and Ponderosa were the best yielders. The trial was repeated this year and Early Large Red gave the highest yield.

(iv) BIHAR (SABOUR), 1937-38.

The work at the station has been concentrated on the mango. Some problems of the litchi and papaya cultivation were also undertaken.

The report shows, that a number of promising mango varieties have been selected, which give promise of turning out to be good commercial varieties. The work on propagation has resulted in definite suggestions for improvements in nursery practice and information regarding the top working of trees. On the cultural side the effects of cultivation on the various aspects of the mango tree have clearly been elucidated. The bearing habit of the tree has been studied in detail. The work on tree morphology was taken up and relationships have been established between its growth and bearing habit. The keeping quality of the mangoes was studied and recommendations made on their packing. Progress has been made in investigations on litchi propagation and fruiting habits.

The Physiological Botanist who returned from East Malling, England after training devoted his time mainly to a survey of the general conditions of mango production and morphological and physiological studies.

(v) BOMBAY—(COLD STORAGE SCHEME, POONA) 1937 SEASON.

In this scheme the following are some of the results obtained during the year:—

(*a*) *Orange.*—The fruit of the "Khatta bahar" could be kept in good condition at about 40°F. for about ten weeks but it showed a higher rate of wastage than fruit of the "Meetha bahar". The Malta orange could be kept at the same temperature for four months in a satisfactory condition.

(*b*) None of the mango varieties from the United Provinces, Madras, Bengal, Hyderabad State and Cochin were found suitable for cold storage.

(*c*) Only fully mature potatoes were found suitable for cold storage.

(*d*) The Basrai variety of banana ripened satisfactorily at 60° and 68°F. with development of yellow colour.

(*e*) The "Delicious" variety of apples obtained from the United Provinces kept very well for eight months.

(*f*) Similar experiments on chikoos, strawberries, litchis, pine-apples and vegetables are in progress

(vi) CENTRAL PROVINCES AND BERAR (NAGPUR), 1937-38.

The scheme was started on the 30th April, 1937. The report reviews the work of the first year, consisting mainly of observations on some aspects of nursery practice and on certain insect, fungus, and physiological diseases. No site for the joint experimental station had yet been selected.

(vii) HYDERABAD—DECCAN.

It is proposed to carry out work on two fruits, *viz.*, custard apples (*Anona squamosa*) at the main Experimental Farm, Himayatsagar (Hyderabad) and grapes (*Vitis vinifera*) at Aurangabad. The technical programme of work under the scheme was examined by the Advisory Board at its meeting in November 1938 and work will start soon.

(viii) MADRAS, 1937-38.

The research work at this station consisted of:—(1) comparison of stocks (2) testing of varieties and (3) study of propagation methods.

The following results were obtained during the year.

(*a*) *Citrus*.—The presence of a slice of wood in the orange and acid-lime bud-shields has contributed to a significantly higher 'take' of buds on *kichili* stock than when budding is done with the wood absent.

(*b*) The practice of lopping the *kichili* stock root-stocks at the time of bud-insertion has stimulated 'bud-break' both in *chinee* orange and acid-lime scions.

(*c*) Selection of earlier germinated seedlings of the *jamberi* stock in preference to those that germinate at a later stage, with the hope of raising vigorous root-stocks has been shown to be an unprofitable nursery practice.

(*d*) Within a month from the date of sowing, seed of *kichili* stock produced a significantly higher germination percentage than *gajanimma* stock. The highest germination percentage was obtained within this period in October, in both the varieties.

(*e*) For convenience of root-grafting and in-arching operations, sowing of unshelled mango "stones" with the plumule up offers greater advantages than the prevalent method of sowing the unshelled "stones" flat.

(*f*) Root-grafting has been shown to be a feasible nursery practice in mangoes.

(*g*) The possibility of raising budded mango plants on a commercial scale has been indicated by the trials carried out during the year under report.

(*h*) A 'grafting-pot-stand' has been devised to facilitate the raising of a larger number of grafts from choice parent trees than it is possible by the method in vogue.

(i) A pine-apple 'eye-extractor' was also devised, and this has proved its usefulness in removing the 'eyes' from pine-apples in less time, with

less wastage of flesh and juice and more neatly than is possible by the prevalent method of extraction of 'eyes' with penknives.

(ix) MYSORE—(HESSERGHATTA), 1938-39.

Work was started during the year. The proposed experiments mainly consisted of varietal and manurial trials on apples and citrus. The lay-outs of these are according to the advice of the Agricultural Commissioner and the Council's Statistician.

(x) NORTH-WEST FRONTIER PROVINCE.

The Council sanctioned in 1936 a sum of Rs. 20,000 for the provision of a Horticulturist for a period of five years. As no qualified candidate was available, there was some delay in starting the scheme, but in view of the urgency of the work Mr. R. Zarbakht Khan of the Horticultural Research Station, Sabour (Bihar), was transferred to that province and simultaneously, arrangements were made for the training abroad in horticulture of an agricultural officer from the North-West Frontier Province, the Council paying his passage and tuition fees. Mr. Khan joined his appointment in October 1938 and has submitted a technical programme of work.

(xi) PUNJAB—(COLD STORAGE OF FRUITS AT LYALLPUR), 1937-38.

This work is done in a small plant of 1½ ton capacity originally erected in collaboration with the cold storage company of Northern India. Preliminary experiments on Quetta grapes, *Haitha* (*Munaqa*) and *Kishmish* (bedana), were conducted. Three citrus fruits, *viz.*, Malta (*Citrus sinensis*) *sangtara* (*C. nobilis*) and grape fruit (*C. maxima var. uvacarpa*) were studied for their storage temperature, life, influence of size and wrapping treatment. One variety of Malta oranges could be kept in excellent condition for over 4½ months: Experiments on mangoes and pears are in progress. The effect of different stages of maturity, treatment with borax solution and wrapping is being studied.

The programme of work for the year 1938-39 was approved by the Advisory Board at their meeting in November 1938.

(xii) PUNJAB—RESEARCH ON CITRUS STOCKS AND GRAPE VINES.

The report for 1937-38 reviews the work done during the second year of the scheme.

The following are some of the results got during the year:—

In citrus stocks there is little difference in the maximum expansion of lateral roots whether the stocks are raised from seed or by the rooting of stem cuttings. The number of lateral roots and their zone of distribution is comparatively larger if the stocks are raised from seed. The number of vertical roots is much larger in the case of the stocks propagated from seed. In fact the tendency of stocks propagated from stem cuttings is not to throw out any vertical roots.

The behaviour of 1 to 1½ year old stem-budded citrus plants growing on certain root stocks propagated both from seed and by the rooting of stem cuttings was studied and certain differences discovered.

(xiii) PUNJAB—FRUIT AND VEGETABLES PRESERVATION SCHEME, 1937-38.

The methods of manufacturing various products standardized so far were given a semi-commercial trial in the Canning Hall built and equipped with machinery at a cost of over Rs. 10,000 from the Government of India Rural Reconstruction grant. At the suggestion of Sir John Russell samples were sent to England for opinion. Products were favourably reported upon by Messrs. J. Lyons and Company, London. The following are some of the important results obtained during the year:—

(*a*) To study the comparative value of the addition to orange squash of peel emulsion and orange oil, separately. 12 different sets of orange squash with 45° Brix and 65° Brix sugar concentration in the finished product using varying amounts of orange oil and peel emulsion (separately) have been chemically preserved and also pasteurized.

Previous experiments on the preparation of squash from *sangtra* oranges, indicated that the product during storage underwent rapid deterioration in flavour and taste. Experiments in this direction were continued. The flavour of different sets of squash has been fortified, separately, by the use of peel emulsion of Malta oranges (instead of *sangtra* peel) and by the addition of essential oil of Malta oranges. The data on the cut-out tests of these sets will be collected during the course of next year.

(*b*) The experiments to see the effect of different methods of preservation on food value (Vitamin C content) of citrus fruit squashes during storage have so far revealed that:—

Irrespective of sugar concentration and methods of preservation the loss of Vitamin C in orange squash is greater than the corresponding loss in lemon squash.

Squashes preserved with sulphur dioxide showed least deterioration in their nutritive value (Vitamin C) when compared to those preserved with sodium benzoate or pasteurization.

Orange squash prepared from juice preheated to 87·5°C. for 2 minutes showed less deterioration in Vitamin C than that prepared from unheated juice. This phenomenon is reversed in the case of lemon squash.

(*c*) *Apple Juice Products—Unfermented Apple Juice.*—During 6 months storage apple juice both clarified and unclarified, obtained from first grade fruits of two varieties of apples, Yellow Newton Pippen and Baldwin (abundantly grown in Kulu valley) has retained the characteristic apple flavour and aroma to a marked degree. In view of these very encouraging results the unfermented apple juice industry seems to have a bright future.

Apple Vinegar.—Experiments in this direction are still in progress and the rate of acetification of different lots of vinegar prepared under different treatments is being recorded.

Small lots of concentrates of the juice of malta, lemon and *falsa* (*Grewia asiatica*) were prepared by two methods freezing and vacuum concentration. The juice was sweetened to about 30° Brix before concentration and the product obtained from this by freezing gave the best product when compared to the concentrates prepared by other treatments.

(*d*) The method of Atkinson and Strachan (Fruits Products Journal, Oct., 1936) of candying fruits in an invert sugar syrup by the addition of appropriate amounts of citric acid in the cane-sugar syrup (instead of

using a syrup containing glucose and cane sugar) has been tried. The product obtained by this method is much superior to that obtained by using cane sugar syrup alone.

The Fruits Sub-Committee of the Advisory Board (November 1938) recommended that the papers published recording the results of this research should be republished by the Imperial Council of Agricultural Research as bulletins. Attention was also drawn to the necessity for finding some way other than by adding Malta orange peel emulsion in order to improve the flavour of squashes since in the Central Provinces Malta oranges were not available. This matter will be taken up next year.

(xiv) ORISSA.

As a result of rearrangement of Provinces the Province of Orissa was left without any nucleus staff for fruit research and the Council sanctioned a sum of Rs. 15,500 for three years so as to enable that Province to take advantage of the information already available on citrus research in Madras, the Central Provinces and Berar and Bihar. A technical programme of work was prepared in consultation with the Agricultural Commissioner with the Government of India and the Statistician to the Council and was approved by the Advisory Board at their meeting in November 1938. The experiments consist of (i) root-stock trial for *santra* oranges (ii) trial of exotic varieties and (iii) manurial and irrigation trials. A supply of authentic root-stocks, budded material and young trees of exotic varieties has been arranged for from other research stations. The work of the station will start from 1939-40.

(xv) UNITED PROVINCES (HILL FRUITS)—CHAUBATTIA: 1ST APRIL 1937 TO 5TH OCTOBER 1938.

(A) Horticultural.

The following are some important results obtained during the year:—

(1) *Apples.*—The work so far conducted on apple stocks consisted of collection and selection. Twenty-two stocks both local and foreign were collected and their behaviour in the nursery as to the ease with which, they propagate, their bud-taking qualities their root systems and their freedom from insect pests and diseases were studied. Based on these observations, six stocks which showed indications of proving satisfactory were selected. A randomized experiment has been laid out to test the effect of these six stocks on scions. A varietal trial consisting of ten commercial varieties has been laid out to elicit definite information upon their comparative economic value.

Under cultural experiments the effects of *thinning*, *ringing* and *pruning* were studied. Results of experiments to study the comparative merits of different methods of propagation prevalent in the hills, show that budding in September either with or without wood and grafting in March with grafting wax as the covering material, are the best methods of propagation. In arching vigorous root-stocks to the tree trunk to supplement and eventually largely replace the existing root system is being tried as a means of rejuvenating old apple trees. The keeping qualities of the prevalent varieties of fruits, the use of different impregnated wrappers, waxing, peat, etc., and the effect of different size of fruits on their storage life were studied.

(2) *Peaches.*—Experiments laid out to test the effect of heading back and application of different manures, have indicated that heading back old peach trees and applying a complete fertilizer to them in the form of artificials, help in putting new life into the trees which bear better than the trees not so treated. Although there is a complete loss of crop in the first year from treated trees, by the third year they begin to bear more so that they make up for the loss of the crop in the first year.

(3) *Methods of replanting an old orchard in the most economic way.*—A system of interplanting between existing old trees, the latter to be removed when the former attain the bearing age is being tried against removing the old trees altogether and planting afresh.

(*B*) *Entomological.*

(4) Entomological investigations comprised of the continuation of the various experiments carried out in 1936-37 in order to study the habits, responses to environmental conditions and food material of young larva if *Lophosternus hugelii*, field scale control experiments against Wooly Aphis, scale insects, defoliating beetles, and apple-root borers, observations on the seasonal history and distribution of woolly aphis and its predators, the susceptibility of different apple stocks to woolly aphis attack and a study of the migrations of aphids from roots to shoots and *vice versa*. Experiments were also laid out to study the interaction between apple stock and scion with regard to woolly aphis attack and to study the effect of different types of soils on root colonies.

(*C*) *Mycological.*

(5) In mycology in addition to the diseases already recorded in the previous reports new diseases of apple and apricot were observed for the first time.

(*D*) *Soil Chemistry.*

(6) A soil survey of the whole of the Chaubattia Orchard at distances 100 feet apart was completed. This involved a study of 208 profiles *in situ*. Twelve profiles could not be studied as they fell on inaccessible places. On the basis of the horizon characters of every profile, a soil map of the orchard has been completed. This shows clearly that profile characters very often change even at distances of 100 feet.

Altogether 638 soil samples were obtained from the 100 feet survey. These were divided into groups according to their visual characters. 87 soil samples were selected finally for analysis. The soils were so chosen as to give an idea of 25 complete profiles spread all over the orchard. Analytical data for 60 soil samples were completed during the year under report leaving 27 soil samples for subsequent analysis.

The determination of pH values of 243 samples left over from last year has now been completed. Further work is in progress in regard to 2,100 samples which have since been obtained from pits subsequently dug for new plantations.

2. Combined Entomological Scheme. Punjab and North-West Frontier Province.

The scheme was started in April 1937. Its principal objects are (1) a survey of the insect pests of fruit trees with special reference to the

present distribution of the San Jose scale and its host plants, (2) examination and fumigation of live plants entering India at Peshawar and (3) examination of fruit entering India through Peshawar and Kurram valley. An extensive survey of the areas in the two provinces has revealed the existence of the pest in several localities in a variety of fruit trees. A number of other pests have also been located in those areas. The local and inter-provincial movement of nursery stock was also studied and fumigation experiments were carried out on such stock. It has been observed that a 45 to 55 minutes exposure of nursery stock to HCN of specified concentration at a temperature of 40°F. to 58°F. killed the insects kept in tubes inside the enclosure without causing injury to the plants. An examination of the fruit entering India showed that up to 30 per cent. of the apple fruit coming from Kashmir and 5 per cent. of the *chilgozas* were infected with San Jose scale.

The first progress report was examined by an *ad hoc* Entomological and Pathological Committee and the Advisory Board in November 1938. The Board considered that the observations so far made necessitated further investigation to define the lowest limit at which the San Jose scale could flourish. It was also suggested that more weight should be given to the examination of the wild hosts of the scale.

Proposals for extension of the scheme which terminated in April 1939 for another year are being put up for the consideration of the Advisory Board.

3. San Jose scale and woolly aphis survey in Kashmir.

As an accompaniment to the above, the Imperial Council of Agricultural Research sanctioned another scheme in 1938 for research on San Jose scale and woolly aphis in Kashmir. The detailed technical programme of work has been approved and the investigations have started.

4. Survey of fruit growing tracts in Baluchistan to determine the distribution of codling moth (Cydia pomonella).

In 1936, the Imperial Council of Agricultural Research sanctioned a small grant to enable the Imperial Entomologist to carry out a survey of the fruit growing regions of Baluchistan with a view to ascertain the distribution and status of codling moth and to determine the exact nature of the damage done by another insect called *Spilonota ocellana* to apples in that area. The survey was carried out during the summer of 1937. About 50 to 75 per cent. of the apple trees were found infected and it has been recommended that (1) attempts should be made to find out whether the codling moth was being imported from Afghanistan and if so to what extent, (2) steps be taken to control it in Baluchistan and to stop its spread. The Advisory Board has adopted these recommendations. The report with a view to disseminate the results of the enquiry has been published in the August 1938 number of the Indian Journal of Agricultural Science.

5. The organisation of the multiplication and exchange of approved fruit tree* stocks.

Sir John Russell has recommended in his Report (page 33) that the Council should arrange for the multiplication and distribution of approved

*Stock (or rootstock)=the rooted part of a fruit tree on which another variety is grafted or budded.

fruit tree stocks. Up to the present, action had been limited to obtain certain important stocks from the East Malling Research Station for supply to fruit experiment stations aided by the Council. The subject was placed before the Fruit Sub-Committee and the Advisory Board in November 1938. The Sub-Committee observed that the question could not be discussed without information from different provinces and states as to the existing organisation for distribution of stocks. It was decided that this information should be called for and presented at the next meeting of the Fruit Sub-Committee. The recommendation of the Sub-Committee was approved by the Board. Enquiries have been issued accordingly.

6. Co-operative trials of Citrus root-stocks.

It is contemplated to start a co-operative experiment on the behaviour of certain well known stocks under different climatic conditions. The provinces selected for this experiment are the Punjab, the Central Provinces and Berar, Assam and Orissa, and the plants of the following five authentic root-stock varieties will be used in the trial:—

(*i*) *Jambri* and Kichili from Madras.

(*ii*) *Kharna Khatta* and *Jatti Khatti* from the Punjab, and

(*iii*) *Jamberi* from Bombay.

The experiments are expected to commence during the next year.

7. Standardisation of records and layouts and co-ordination of fruit experiments.

In the Report for 1937-38 reference was made to the preliminary report of a Special Sub-Committee appointed to examine this question and the suggestions of the Advisory Board for guidance in drafting the final report. The Special Committee held a further meeting in November 1938 and submitted a final report to the Advisory Board. The main recommendations are as follows:—

(1) It was agreed that the standard forms for recording the performance of tree fruits and small fruits and cultural practices may be adopted at all fruit research stations, subject to certain modifications. The information proposed to be obtained in these forms is the *maximum* required, the experimenter to select the particular headings required for his purpose. Regarding methods of measurement it has been recommended that the instructions in Technical Communication No. 2 of the Imperial Bureau of Fruit Production, 1931, should be followed.

(2) It was agreed that the forms for summarising annual data of growth and performance of tree fruits, small fruits and data on cultural records of tree fruits need not be standardised.

(3) Regarding lay-out the Committee stressed the need for experiments to determine the number of trees necessary for individual plots in randomised lay-outs. For the present an experimenter should err on the safe side to ensure results and reduce treatments rather than number of trees per plot.

The recommendations were accepted by the Board.

8. XII. INTERNATIONAL HORTICULTURAL CONGRESS, BERLIN, 1938.

The twelfth International Horticultural Congress was held at Berlin from the 12th to the 17th August 1938. The Indian delegation consisted of:—

1. Dr. W. Burns, D.Sc., Agricultural Commissioner with the Government of India.
2. Dr. H. Chaudhuri, D.Sc., Ph.D., D.I.C., Punjab University, and
3. Mr. K. C. Naik, B.Ag., M.Sc., Superintendent, Fruit Experimental Station, Kodur, Madras.

As the Congress was divided into no less than twenty sections, the three delegates arranged as far as possible to attend different sections, in order to give and get as much information as possible. All, however, attended the session of the Section on Tropical and Subtropical Fruit Growing of which Dr. Chaudhuri had the honour to be the first president. During the discussion Dr. Burns gave an account of the organisation of horticultural research in India. The other sections attended by delegates were:—

Section 1—Fruit Growing,

Section 2—Vegetable Growing.

Section 5—Nurseries.

Section 8—Plant Protection.

Section 9—Spice, Scent and Medicinal Plants.

Section 10—Storage of Fruits and Vegetables.

Section 11—Processing and Industrial utilisation of Fruits and Vegetables.

Section 16—Production and Market Regulation.

Section 17—Special Questions in Plant Physiology.

Of the important papers read mention may be made of the article on "The Present Status of Research on Root-stock Plants and the Use of Root-stock Plants" by Dr. Hatton of East Malling. During the discussion on this paper, Mr. Naik dealt with root-stock problems in mangoes and citrus species carried out in the fruit research schemes of the Imperial Council of Agricultural Research and Provincial Governments in India. Mr. Charley of Long Ashton dealt with fruit beverages of the unfermented group.

One member of the delegation visited the world-famous Plant Breeding Institute founded by the late Professor Edwin Baur at Muncheberg and another visited the Horticultural Experiment and Research Institute at Dahlem.

A full set of the literature pertaining to the Congress is kept in the Imperial Council of Agricultural Research Library and is made available for consultation.

CHAPTER V.

FIBRE SCHEMES.

(i) Bihar Sunn-Hemp Scheme.

This scheme which started work in January, 1937, is for a survey of the sunn-hemp in Bihar and the selection of suitable varieties from the point of view of fibre yield. During the year a general survey of the sunn-hemps in Bihar was made and samples from different ecological localities were collected. Preliminary experiments on the extraction of the fibre showed that early—"deshi"—varieties were usually the best yielders of quality fibre. The highest yield though of poor quality was obtained from the late—"parwaria"—varieties. Varietal trials showed that the Bihar (A) variety was significantly superior in fibre quality and yield to Pakur (B) and Nawada (C).

(ii) Madras Sunn-Hemp Scheme.

The work on this scheme commenced in 1937, the principal object of research being the improvement of quality of fibre with special reference to cleanliness, colour and strength so as to render it fit for European markets. Ten varieties from different parts of the province were tried and it was found that early varieties gave clean white fibre containing bits of pith, and medium varieties the longest and easily the best quality fibre without any pith while the fibre from the late varieties was inferior and dirty. The crop, when harvested at the full bloom stage, gave the highest yield of green stalks.

Manurial trials showed that a basal dressing of five tons of farm yard manure per acre gave optimum yields. Retting experiments indicated that stalks retted after three days' drying gave the best yield of fibre. Again, under still-water conditions of both clean and muddy water retting was found to be earlier by six to twelve hours than under running-water. Bleaching trials were carried out with bleaching powder, washing soda, dilute acids, and half per cent. of potassium permanganate with one per cent. acidified sodium bisulphate. The last reagent showed the best result without much affecting the strength of the fibre.

(iii) Flax Fibre Scheme, Bengal.

As had been proposed last year, the crop was grown in cultivators' fields in three localities representing different types of soil, *viz.*, in the Rangpur, Faridpur and Tippera districts. In the Rangpur district the season was not favourable to the crop and in the other two districts the crop was satisfactory. Breaking and scutching machines were sent to the centres in charge of assistants for the fibre to be extracted by the cultivators themselves. In addition, the crop grown at the Government farms was sent to those places where the crop was not grown for demonstrating to cultivators the method of extracting the fibre from the dry plants.

During the year, in addition to "Liral Monarch" and "JWS", a few more varieties were grown with a view to find out strains with good quality fibre and high outturn of seed. One experience gained by the work so far carried out is that the breaking and retting should be done immediately

after harvesting, and that scutching could be left till the advent of rains, when no out-door work was possible. It was also found that the longer the straw is stored the less the chances for the crop to deteriorate.

A beginning has been made this year to bring home the process of extraction to the masses so as to establish this as a cottage industry.

(iv) SUNN-HEMP SCHEME, CENTRAL PROVINCES.

This scheme started in January, 1937. The botanical part of the scheme provides for a systematic collection of sunn-hemp varieties from all over the province and other provinces with a view to find out suitable types, study of the biology of the flower, and of seed-setting. The chemical part of the scheme provides for a study of (i) the effect of seed-rate, time of sowing, and time of harvesting on the yield and quality of fibres, and (ii) the examination of other factors, such as temperature, standing or running water affecting the quality of the fibre. The varietal experiments have indicated that there is no significant difference in the yields of dry straw between the two varieties at Jubbulpore and Chhindwara, and that they are highly significant in yield over the Pusa variety.

It is also found that optimum seed rate is 80 to 100 lbs. per acre. Earlier planting gives a better yield than late planting and the highest yields are obtained when the crop is harvested at the dead-ripe stage.

It was observed that the fibre obtained by retting the stalks in running water was fairly free from gummy material and better in colour than that obtained by retting the stalks in standing water.

CHAPTER VI.

OIL SEEDS RESEARCH.

(i) MADRAS GROUNDNUT SCHEME.

Work on this scheme commenced in January 1937 and the object of the scheme is to produce races of groundnut with high yield and oil content, low fatty acid content, resistant to disease and adaptable to different conditions of soil and climate. The report for 1937-38 was on the work during the first year of the scheme experiments on the selection of bunch and spreading varieties were in progress. Crosses were made between bunch and spreading varieties to evolve high yielding bunch varieties of short duration high oil content and dormancy of seed. Manurial experiments showed that potash and phosphate alone increased the yield and that manurial treatments did not affect the oil content of the seed.

(ii) PUNJAB OIL-SEEDS SCHEME.

This is the second year of the scheme. The object of the scheme is the improvement of *Brassicae* oilseed species grown in Northern India. During the year under report, methods of mass selection for the improvement of self-sterile forms of *toria*, *sarson* and *taramira* resulted in the evolution of high-yielding strains. Arrangements have been made to multiply these on a large scale for distribution to farmers and also to maintain their purity. A new method of breeding in which selected plants were made to cross amongst themselves with the help of bees under controlled conditions was tried for the first time and was found successful. A number of fresh crosses among the various *Brassicae* were made with a view to studying their genetic behaviour. Investigations into the effects of different manurial and irrigation treatments into the growth and oil content of *toria* seeds were continued.

(iii) OILSEEDS SCHEME, CENTRAL PROVINCES AND BERAR.

The scheme started in February 1937 and the work was on four important oilseeds; linseed, seasamum, safflower and niger. The aim is to evolve high-yielding and disease and pest resistant types, with good quality of oil. Selections were made from samples collected from other provinces of strains possessing valuable economic characters. Pollen sterility to a variable degree was observed in sesamum, niger and safflower. Local sesamum varieties whose root-systems could be classified under either of the two heads, shallow or deep, were studied. Retting experiments with linseed stalks were conducted and it was found that dipping for five days in fresh river-water and for seven to eight days in masonry tanks was necessary for complete retting.

(iv) HYDERABAD CASTOR IMPROVEMENT SCHEME.

The report covers the third year of the scheme. An intensive study of single plant cultures was the main work during the season and strains possessing useful economic characters were selected. As the small-seeded varieties were greatly in demand by local buyers more attention was paid to these. The programme of work was simplified, and all yield trials stopped till pure strains are obtained.

(v) Travancore Coconut Diseases Scheme.

This scheme was initiated in March 1937, to deal with two diseases, *i.e.*, of the root and the leaf of the coconut. The work consisted of mycological analysis of the infected material, inoculation experiments, studies in the physiological relationship of the fungi responsible for the infection and a soil survey of the affected areas including the analysis of affected soils. The survey of the infected areas in Central Travancore has shown that the age of the trees or the differences in the soil have no effect on the incidence of the disease. The disease has been observed on palms growing on sandy soil along the sea-beach, light sandy loam, fine alluvial river silt along the banks of rivers and on laterite soil on hill slopes and hill tops. Mycological studies of infected material revealed a number of organisms and *Helminthosporium* was found to be the most virulent. The results of chemical analysis of soil samples from the coconut areas of Cochin and Travancore showed that most of the soils were deficient in some important soil constituents, *i.e.*, nitrogen, potash and lime. This depletion of nutrients and unfavourable conditions of growth probably provide a predisposing condition in coconut palms for infection by root parasites, but further research work is necessary before any final conclusions can be drawn. Investigations of the diseases in the Cochin State indicates that the problems in both the States are identical.

(vi) Working of the Oil Selection of the Harcourt Butler Technological Institute, Cawnpore.

This is the final report on the working of the section. It gives an account of the multifarious activities of the section pertaining to technical advice, important and useful researches undertaken, and specialised training in technology of oils and allied products, to students from all parts of India.

(vii) Madras Coconuts Scheme.

As stated in last year's report the object of the scheme is the investigation of the several problems connected with the yield of the nut, copra, oil and the manufacture of coir. The scheme is designed to extend the work of the research stations already maintained by the Madras Government on the west coast of India. Financial sanction to the scheme has been conveyed and work is likely to commence this year.

CHAPTER VII.

POTATO RESEARCH.

Potato Breeding Scheme for Northern India.

This scheme has been in progress since April 1935. During 1937-38 the study of material collected from different parts of India was continued and after eliminating duplicates, about 50 varieties were selected for further detailed study. Some of the American varieties and their hybrids of crosses with *S. tuberosum* were found to be highly resistant to late blight, and possessed a certain amount of cold resistance. A number of new interspecific crosses were made and data regarding sterility and compatibility were collected from previous crosses of a similar nature.

Problems of storage and dormancy are also being tackled with a view to select varieties which will resist rotting in storage. Preliminary investigations have indicated that there are striking differences between potato varieties in this respect. A study of artificial methods of breaking dormancy at Pusa has shown that American methods developed by Denny and others are likely to prove successful under Indian conditions.

The Imperial Council of Agricultural Research contributed towards an expedition organised by the Imperial Agricultural Bureaux to South and Central America to collect species of solanum. The expedition has since left and the material collected is expected to be received shortly. Necessary additional equipment for receiving and handling the material are also being provided at the research station.

Madras Potato Research Scheme.

Both inter-specific and inter-varietal crosses were made with choice varieties of *Solanum tuberosum* possessing desirable characters. A few exotic species were also employed in these crosses. As a result of this work a few hybrid cultures have been produced which are showing ten to thirty-seven per cent. more yield than the existing standards. The scheme terminated in March 1938.

CHAPTER VIII.

TOBACCO RESEARCH.

(i) Co-operative flue curing experiments.

The scheme came into operation in 1935 when seeds of Adcock, Harrison's Special and Pussa H 142 were supplied to the co-operative centres. In 1935-36 only a few samples of cured leaf were received by the Imperial Economic Botanist, as most of the provinces had difficulty in erecting their barns in time. The provincial authorities concerned were also requested to give information regarding the acreage grown, dates of sowing, dates of transplanting and harvesting, total yield of cured leaf per acre, the percentage of leaf of the three principal grades, nature of soil, manuring, previous cropping, irrigations, incidence of pests, etc. The valuations were arranged by the Imperial Economic Botanist with the co-operation of the Indian Leaf Tobacco Development Company and the Indian Tobacco Association, Guntur, and results are now available only up to 1936-37. The reports from the co-operative centres together with the opinion of the Imperial Economic Botanist are for consideration by an *ad hoc* tobacco sub-committee and the Advisory Board.

(ii) Training of tobacco officers.

On the recommendation of the Botanical and Physiological Committee of the Council which was approved by the Advisory Board, the Governing Body sanctioned in July 1938 Rs. 8,500, for training in America an Indian worker engaged in the work of tobacco cultivation, to study the different aspects of tobacco cultivation in that country such as seedling, cultivation, curing, grading, redrying and reconditioning, and packing and storage. The Governing Body considered that a similar provision should be made for training two more men, one each from Bihar and Bombay. Mr. C. V. S. Chetty was selected and sailed for America in April 1939. The two officers from Bombay and Bihar will be appointed after Mr. Chetty returns in November 1939.

(iii) Tobacco sub-Station, Guntur.

The first year of the scheme was 1937-38.

The following are some of the observations made:—

I. The basal dressing on the mineral manure plots encouraged earlier, more rapid and well-sustained maturity, similar to the 'Farm Yard Manure' plots.

The basal dressing on the mineral manures was beneficial over 'no basal dressing' as regards green leaf yield. N, K, N.P, P.K. NPK gave longer period of glow with basal dressing than without basal dressing. In general, the glow was longer in flue-cured than in sun-cured tobacco. 'No Manure', 'Farm Yard Manure,' NPK, NP, PK, gave mild flavours, while N, P. K and NK gave strong flavours.

II. The differential effects of the preceding crop of cereals on the succeeding tobacco crop were not significant as regards, total number of leaves, and number of useful leaves.

III. *Pre-sweating.*—With heavy-bodied leaf, bulking of sticks for 24 hours after stringing as opposed to the usual practice, was found to improve the curing qualities.

Fuels.—Groundnut husk proved the cheapest fuel. Coal worked out cheaper than casurina and babul wood fuels at this year's market rates.

IV. *Study of leaf-curl diseases.*—This is being done by the Botanical, Mycological and Entomological sections of the Imperial Agricultural Research Institute, working in co-operation with each other. The investigations were carried out at the Botanical Sub-Station, Pusa, as the leaf curl disease is rare in Guntur. As regards the incidence of leaf-curl at different times of the year the general trend was similar to that of last year. Further experiments on the insect vectors were conducted and it was shown that *Ageratum conyzoides* is an important alternate host of tobacco leaf-curl.

CHAPTER IX.

SOIL STUDIES.

(i) Study of soil problems in Bengal.

A study of the movement of soil moisture under field conditions including the study of the moisture profile indicated a gradual increase of moisture content in the lower layers which attained its maximum at about two feet. The moisture content equilibrium considerably varied from place to place but the average depth at which the equilibrium moisture zone was situated was almost the same in all cases so far examined.

Investigations on the influences of lime on red laterite soils as represented by the Dacca Farm, with special reference to the retention and evaporation of soil moisture, showed that continuous liming in heavy doses was injurious in the long run.

Investigations in pan formation in the Backerganj District has afforded valuable information for initiating further research.

Research work on the water requirements of the rice plant at various stages of its growth had been conducted with a view to find out the critical stages, if any, in the life cycle of the plant. It has been observed that soil moisture below 33 per cent. soil saturation capacity considerably reduced the yield and that the addition of phosphate to the soil minimised the water requirements.

(ii) Mechanical analysis of lateritic soils and the nutrition of the rice plant, Dacca University.

Mechanical analysis of soils.—The physico-chemical properties of the soil samples collected on profile basis from different parts of Bengal and of Central and Southern India have been determined. Examination has been made as to how far saturation with lime at pH 7·1 affects the maximum water holding capacities, maximum xylol-holding capacities and percentages of imbibitional water. In general, it is found that the maximum water holding capacity increases on saturating the soil with lime at pH 7·1. The change suffered by the percentage of imbibitional water of the soil after saturation with lime at pH 7·1 does not show any regularity. It has been observed that the C/N ratios of the soil samples decrease as the depth of the profiles increase.

With a few exceptions the saturation capacities of soils from Dacca, Suri, Bidar, Himayatsagar, Nagpur, Raipur, Alisagar and Guntur increase with the increase in the depths of the profile. The profiles from Cannannore, Guntur and Comorin show the opposite behaviour. The profiles from Nilgiri Hills show a minimum saturation capacity at intermediate layers.

The variations of total exchangeable bases in the profiles do not show any regularity, although there is a marked tendency for the total exchangeable bases to increase with the increase of the depth of the soil layer. In general the ratio of exchangeable calcium to the total exchangeable bases expressed as a percentage decreases with the depth of the profile.

Typical soil monoliths and soil samples of red soils were collected from a number of districts in Chota Nagpur and were all found to be more or less similar. From a study of monoliths and samples collected from

several places in Orissa, it has been found that the nature of the soil varies from place to place.

Problem of Nitrogen supply to rice plants.—The investigation falls into two important stages:—

(1) the fixation of nitrogen in the rice-field soils,

(2) the biochemical changes occurring in the rice-fields.

(1) *Fixation of nitrogen in rice-fields.*—Fixation of nitrogen in rice-fields has been studied under both (1) water-logged and (2) dry conditions.

Experiments with a large number of rice-field soils, collected from different parts of India have shown that a considerable amount of nitrogen is fixed in some of them (those having pH above 6) when they remain submerged.

It has also been conclusively proved that the agents responsible for the above fixation are certain blue-green algae. Four species of blue-green algae (three *Anabaenas* and one *Phormidium*) have been obtained in a condition completely free from bacteria and other contaminating organisms. The bacteria-free cultures have been subjected to rigorous tests by the bacteriological department of the Rothamsted Experimental Station which has confirmed their purity. Careful experiments with these bacteria-free cultures showed clearly that the blue-green algae present fix atmospheric nitrogen, and this is the first time that this fact has been established. The effect of different conditions on the fixation of nitrogen by the algae has also been studied.

Experiments were also undertaken to ascertain whether any measurable amount of nitrogen is fixed in rice-field during the dry period, *i.e.*, after harvest, till next transplantation. The result showed that although fixation of nitrogen took place in some of the soils, yet by no means can it be regarded as general as the fixation under water-logged conditions.

In the course of the above investigation a considerable fixation of nitrogen was observed in a few soils which did not contain any of the common species of *Azotobacter*. It was therefore thought that the fixation observed was brought about by some undiscovered organisms. After a thorough search, a new species of *Azotobacter* (*Az. indicum*) has been isolated from Dacca soil. This organism is more acid tolerant and fixes more nitrogen than any of the species previously described. It has been investigated in detail at the New Jersey Experiment Station.

(2) *Biochemical changes occurring in the rice-fields.*—The various ways by which nitrogen may be lost from the water-logged soils have been investigated. It has been found that the nitrate formed during the dry season is rapidly assimilated by the micro-organisms when the soil is water-logged, and that there is little loss by denitrification or by leaching. Evidences were obtained which indicate that a large quantity of nitrogen might be lost from water-logged soils as a result of the anaerobic decomposition of the organic matter.

(iii) Scheme of research on colloid soil constituents.

Reference has already been made in the last report to the extension of the scheme for a period of five years from November 1938. On a recommendation by Sir John Russell it has also been decided that Professor Mukherjee (and one of his assistants) should be given facilities for proceeding to England for six months to consult other workers engaged

in similar investigations. It is expected that Professor Mukherjee will proceed to England during 1940.

The progress report on the work done under the scheme during 1937-38 was considered by the Soil Science Committee and the Advisory Board in November 1938. The previous work on hydrogen clays was extended during the year under report to clays isolated from other soils. A study was made of the base exchange capacity, the total and individual exchangeable bases, the pH of water, KCl extracts and the content of exchangeable hydrogen of some Indian soils using different methods of estimation. The peptising action of sodium ferrocyanide on the colloidal matter of some Indian soils was also studied. Under certain conditions this reagent has been found to serve as a fairly good dispersing agent in the mechanical analysis of these soils. The report was approved by the Advisory Board with the remark that the work had made considerable progress in elucidating the scientific foundation of soil acidity and base exchange.

It is expected to publish a connected account of the work so far done under the scheme shortly.

(iv) RESEARCHES AT THE INDIAN INSTITUTE OF SCIENCE, BANGALORE, ON THE COMPOSTING OF TOWN REFUSE AND WASTE MATERIALS.

A detailed study of the various factors influencing the efficiency of the hot-fermentation process showed that (1) an optimum proportion of the organic and inorganic fractions of street sweepings and of night soil is necessary for the effective and rapid fermentation of the compost heap. (2) the addition of moderate amounts of the soil fraction of street sweepings helps to secure a great conservation of organic matter and of nitrogen and improves the quality of manure obtained, (3) an optimum moisture content of about 50 per cent. should be maintained (4) the temperature rapidly rises to 60—65°C. in two or three days after which it slowly falls and at the end of five or six days is about 50°C., (5) greater losses of nitrogen occur if the period of preliminary aerobic fermentation is prolonged beyond a week, (6) the addition of chemicals has no beneficial effect on the course of decomposition and (7) the greatest conservation of nitrogen is secured by conducting the hot-fermentation in brick-lined and plastered trenches.

A comparison of the different methods of composting town refuse (wholly aerobic, wholly anaerobic and the hot-fermentation method,) showed that the greatest loss of carbon and nitrogen occurred under wholly aerobic conditions and the greatest conservation under wholly anaerobic conditions, so that the hot-fermentation method was a *via media* between the other two methods. Semi-large-scale experiments on the composting of town refuse, using either night soil or cattle urine and dung as starters confirmed the superiority of the hot-fermented compost over the aerobically prepared one especially when the hot-fermentation was conducted in brick-lined and plastered trenches.

The economics of the systems of composting night soil and of poudrette manufacture were compared and the conclusion arrived at was that it would be economically advantageous for a municipality to concentrate on the preparation of wood-ash poudrette to the limit of available household ash and to divert the remaining portion of night soil for composting.

Pot and plot experiments carried out on crops such as barley, beans, tomatoes, lucerne, *ragi* and *jowar* showed that composts exerted highly significant manurial effects as measured by increase of crop yields. The increases obtained by hot-fermented manure were significantly higher than those obtained by the aerobically prepared manure and the crop response of manure prepared purely by the anaerobic method was found to be poor.

Laboratory investigations have been started in order to study the superiority of hot-fermented manure over the aerobic one.

As recommended by Sir John Russell steps have been taken to write up the results of the work which will be published by the Imperial Council of Agricultural Research.

(v) SCHEME OF RESEARCH ON NITROGEN LOSS AND NITROGEN FIXATION IN SOILS BY DR. N. R. DHAR, ALLAHABAD UNIVERSITY.

A brief reference has been made to this scheme in the report for 1936-37. Since then Dr. Dhar has submitted his progress reports for 1936-37 and 1937-38. On investigations on the fixation of nitrogen in dark at different temperatures it has been observed that nitrogen fixation in the dark is highest at 35° and ceases at a minimum of 10° and maximum of 60°. Also nitrogen fixation is possible when energy materials are mixed with soil under sterile conditions and exposed to light. Light appears to be as important as bacteria in the process of fixation of atmospheric nitrogen in tropical soils. Dr. Dhar has also shown that (a) when nitrogenous manures are added to the soil either in fields or in pots or in dishes, there is a considerable loss of nitrogen in the process of nitrification, (b) this loss is greater in soils exposed to sunlight than in those kept in dark, (c) the amount of nitrate formed in the soil is generally greater in the soils exposed to sunlight than in the dark ones although the temperature of the exposed and unexposed may be the same, (d) when the total nitrogen added to the soil is the same, the loss is greater with ammonium sulphate than in the case of oil cake, (*e*) this loss is minimised when molasses and carbonaceous substances are added to the soil along with the nitrogenous manures.

The Soil Science Committee and the Advisory Board considered these results in November 1938 and were of the view that the statement relating to total nitrogen should be accepted with great reservation. It was not possible to draw definite conclusions because no statistical analysis had been made. The Committee also agreed that the conclusion regarding the rôle of light in the fixation of atmospheric nitrogen was a far reaching conclusion and was not supported by experimental evidence.

The Committee's remark on item (c) was that several workers had been unable to confirm this in India and that a good few had obtained contradictions. A few other statements were also open to doubt and were not established by the data provided.

In general, the Committee was satisfied about the need for the plots being replicated and observed that in order to get statistically valid estimates of various determinations it was necessary that the number of substances dealt with in the experiments should be reduced. It was also agreed that Dr. Dhar's attention should be drawn to Bal's wet method for the estimation of total nitrogen.

CHAPTER X.

PLANT PHYSIOLOGY RESEARCH.

Research on the Physiology of Sugar Cane and Wheat (Benares Hindu University).

The scheme started in June, 1937, and the following are some of the conclusions so far drawn based upon a study of the growth efficiency of sugarcane in relation to elemental intake and growth of wheat in relation to soil nitrogen and soil moisture.

(1) Nitrogen combined with phosphoric acid and potash increased the sugarcane yield considerably.

(2) In the case of sugarcane, application of fertilisers soon after germination gave the best results, while sucrose content improved by the application of N and P soon after germination and K two months later.

(3) In the case of wheat, for better protein formation and accumulation, both nitrogenous and phosphatic manures are essential.

Of the various treatments applied the highest grain yield was obtained when nitrogen was applied in the form of ammonium sulphate or niciphos. 100 lbs. of Nitrogen per acre gave the best yield of both grain and straw.

Researches in Plant Physiology and Cytology (Mr. Bosi Sen).

The original scheme terminated in November, 1938, and the extension scheme, which is on an enlarged scale, started from that date. The scheme has now been transferred to the administrative control of the United Provinces Government.

Studies on the three major constituents of living plant cells, *i.e.*, plasma-membrane, Cytoplasm and nucleus, were continued. Vernalisation studies were continued, mustard being the main crop under investigation and the following are some of the conclusions:—

(1) Plants from dried unsplit vernalised seeds show a statistically significant earliness in the opening of first flowers, irrespective of the season.

(2) This earliness was 18·1 days in Mustard type 21.

(3) Unsplit vernalised seeds can be dried over 15 weeks under Almora conditions without being devernalised.

Similar studies are being undertaken in the case of linseed, garden pea and sweet pea.

CHAPTER XI.

LOCUST AND PLANT DISEASES RESEARCH.

Locust Research Scheme, Karachi.

(1) *Locust Swarm Movements.*—There were no reports of locust swarms anywhere in the Indian areas during 1938-39.

(2) *Locust Survey Work.*—Work was carried on on the same lines as in the year previous. In addition to the usual areas, parts of Kachhi, Upper Baluchistan, Kathiawar and Cutch were also surveyed more than once in the course of the year to detect the breeding of the Migratory as well as the Desert Locust.

(3) *Ecological Work.*—Routine observations were continued during the year. As advised by the Locust Committee, no fresh experiments on the food plants of the locust were undertaken.

(4) *Locust Developments in 1938-39:*—

(A) *Schistocerca gregaria.*—The Desert Locust:—

(a) *Winter Period—1937-38.*—In the Sind-Rajputana area, over-wintering occurred mostly in the Thar-Mallani tract, and to a very slight extent in the Sardarshahr tract. In the western areas, fair numbers of locusts were found in winter in the Lasbela and Mekran tracts.

(b) *Spring Breeding 1938.*—No locusts were found in the Thar-Mallani tract or in Sardarshahr by March. Though none were found in the winter months in the Kachhi-Bolan areas, small numbers of the Desert Locust were noticed here by March. Small numbers of hoppers were found in the Bolan and Harnai tracts during April-May.

With the fall of moderate rainfall during the winter months, light breeding was noticed in March-April on the Mekran coastal reks, and by April-May also in the interior valleys of Mekran.

(c) *Summer Migration, 1938.*—The monsoon burst abnormally early by middle of May, and very early showers were received in parts of the desert. There were no prominent evidences of migration in the desert as in previous years, but as small numbers of adults and a few hoppers were noticed in June-July in the Thar-Mallani areas, and also in the Sri Ganganagar colony tract, light migration had evidently taken place. At Pasni, too, only slight evidence of a migration from outside was observable in June-July.

(d) *Summer Breeding, 1938.*—The monsoon proved to be unsatisfactory, as there was but little rain in July, less than normal in August, and none at all in September. The northern and eastern parts of the desert, such as Bikaner, parts of Jodhpur and Jaisalmer, etc., were badly affected. The breeding was, on the whole, small and restricted to a few places where rainfall had been received. It may be added that the neighbouring parts of the Punjab, such as Hissar, were similarly hit by scarcity of rain.

With the fall of fairly good showers in August in the Lasbela area, some breeding was observed along the coast, as at Gadani. In September-October fair numbers of locally produced adults were noticeable on the Ambagh-Sonmiani Reks, but there was not much evidence of migrant forms from outside as had been noticed in the previous years.

(e) *Autumn Migration.*—By the end of October, the small numbers of new-generation adults noted in the Thar area were found to have disappeared. No locusts were noticed anywhere in the Sind-Rajputana areas after October.

As already stated, there were very few migrants in the Lasbela area this year, nor was there any evidence of migration into Mekran during the autumn and winter months, as usual in previous years. Since breeding in the Rajputana areas had been negligible this year, there were presumably few locusts to migrate, and as a consequence, there was a paucity of migrants in the Lasbela-Mekran areas.

(f) *Winter Period, 1938-39.*—During the winter, small numbers of locusts were seen only in the coastal areas of Lasbela, few were noticeable in the Mekran area till March 1939, and none at all in the Sind-Rajputana areas.

(B) *Locusta migratoria* ph. *solitaria.*—Fair numbers of *Locusta* adults were found among irrigated wheat fields in the Bolan and Harnai valleys in March, 1938, and, by May, quite large numbers of hoppers of *Locusta* were observed in these areas attacking grass and some of the crops. By June, however, few specimens of *Locusta* were to be seen either in Bolan or in Harnai. It was also noted that breeding of *Locusta* had occurred during May-June even in the interior valleys as in Loralai and Kohlu.

During the monsoon period, light breeding of *Locusta* was noted in parts of the Bikaner Canal Colonies, and in parts of south-eastern Punjab. Few specimens of *Locusta* were noticed anywhere in the Rajputana desert during the summer, or even later on. A few were found in the Kathiawar areas in September.

(5) *Study of Old Records.*—The mapping of the old locust data was completed during the year. Much of the time was devoted to a study of the correlation of the meteorological and locust data for the past locust cycles. Much attention was also devoted to the compiling and studying of the data collected in the course of the locust research work carried out since 1931, preliminary to writing up a consolidated account of the results obtained.

(6) *Extension of the Locust Research Scheme.*—Pending final orders of the Central Government in regard to the organisation of locust warning service, the Governing Body sanctioned the extension of the scheme up to 31st March 1939.

Desert Locust Investigation, Lyallpur.

An outline of the important conclusions reached during the year is given below:—

(i) *Food preferences.*—Observations in field cages with fifteen different kinds of plants, showed that the swarms had an inclination to concentrate on citrus plants, which were almost completely defoliated and at many places even the bark was eaten up. On the other hand, *shisham (Dalbergia sissoo)* trees which stood adjacent to the citrus trees were almost untouched; this shows that locusts do make selection when in a position to do so, the choice generally falling on succulent leaves.

(ii) *Incubation and soil moisture.*—The experiments showed that the minimum soil moisture required for the development of eggs of the desert locust differs markedly with the texture of the soil.

(iii) *Development of gonads at some constant temperature during the hopper stage.*—Comparative study of gonads and fats were made on adult locusts, and it was found that the lower the temperature the more favourable it was for fat development. Whereas the size of the testes of the males cannot be said to have any important relation with temperature the size of the ovary of the females have a direct relation with it. The ovary was smallest at 27°C and most developed at 37°C.

Virus Diseases of Plants.

This scheme which is under the Plant Pathalogist to the Government of Bombay, provides for (1) a general survey of the virus diseases of plants in the Bombay Presidency and (2) investigation of specific diseases such as those of Chillies, Cardamom, *Bhendi* (Hibiscus esculentus), etc. Even though the scheme had been approved as early as 1931, it could not be inaugurated until 1937 owing to financial stringency, but advantage was taken of this interval to depute Dr. B. N. Uppal the Plant Pathologist, to visit certain countries in Europe and America to study the problems involved. After his return, the scheme was slightly modified in the light of experience gained by him and funds were allotted in November 1937. The glass house was constructed in 1938 and the staff has recently been appointed.

CHAPTER XII.

DRY FARMING RESEARCH.

The object of this group of investigations is the improvement of crop production in tracts of precarious or limited rainfall where irrigation is not practicable. The schemes in all the five centres for which Imperial Council of Agricultural Research has given grants are due to expire in 1940. The question of their extension is for consideration by the Advisory Board at their meetings in May 1939, when stock will be taken of the work done so far and the lines of future investigation will be determined. The salient features of the Progress Reports for 1937-38 of these schemes are given below:—

(a) *Madras (Hagari).*—Field studies in soil moisture in plots with improved method of tillage, and studies in surface run-off were continued. Root studies in Setaria and Sorghum for different cultural treatments showed that ploughed and bunded plots had a root system which was 37 per cent. greater than in no-manure plots. Both cotton and sorghum following fallow in the previous year had a root system double than where they were followed by a previous crop. Bunding the plots accompanied by ploughing was found to be a definite advantage both from the point of view of increased yield and extra profits. The manurial experiments on Setaria showed that compost and farm-yard manure gave definitely higher yields.

(b) *Bombay (Sholapur and Bijapur).*—The rainfall at Sholapur during the season was not evenly distributed and the agricultural season proved to be one of the worst experienced in this tract. Loss of rain water by surface run-off was very heavy at Sholapur, but was limited at Bijapur.

Experiments on evaporation of soil moistures in different soil types were continued. Physiological and root studies of the jowar plant combined with experiments on transpiration co-efficient are expected to give very promising results.

At Bijapur, the deep black soil responded very well to shallow and alternate year ploughings, to interculturing and to scooping and listing. The limy soil responded distinctly to farm yard manure and to *sann* green manure. The large scale trial of Bombay Dry Farming Method at this station resulted in giving 90 per cent. higher yield of grain and 93 per cent. higher yield of straw when compared with the yields of the local cultivator's methods. The yield level in both cases was, however, only two-thirds of that of the previous year.

(c) *Punjab (Rohtak).*—Experiments on the conservation of soil moisture were continued; soil mulch, as the effect of cultivation after each shower of rain, and interculture were found to conserve moisture.

In rotation experiments, the yields of *bajra* after fallow were double than those of obtained after *guara* or gram and gram after *bajra* gave twice as much yield as gram after wheat. There has been however, no difference in the yield of wheat when sown after *guara* or gram.

The physical and chemical characters of the soil were studied and it was found that soil tilth formed by different ploughs is different and that the yield and the moisture results are influenced by the nature of the tilth.

The water requirements of crops were investigated with a number of strains of wheat, *bajra* and *jowar*. It was found that in heavy loamy soil, artificial soil draught given from the start of the dry weather lowered the water requirements of both gram and wheat but the yields were also reduced, being more marked in the case of gram than in that of wheat.

(d) *Hyderabad* (*Raichur*).—Varietal trials conducted with a number of strains of setaria and jowar gave indications of types suited for both *kharif* and *rabi* seasons.

The improved Bombay Dry Farming Method gave increased yields in the *rabi* experiments. Bunding and mulching did not give any significant result but it was found that slight reduction in yield occurred with "no bunding and no mulching" treatment.

Fallow plots in the previous year gave increased yields over those obtained from continuously cropped plots. This was more marked in the case of *rabi* crops.

CHAPTER XIII

MEDICINAL PLANTS RESEARCH.

SYSTEMATIC CULTIVATION OF MEDICINAL PLANTS AND STUDY OF FOOD POISONS IN INDIA BY COL. R. N. CHOPRA, SCHOOL OF TROPICAL MEDICINE, CALCUTTA.

A large number of plants were collected for the Herbarium which now consists of about 5,000 specimens out of which about 500 are contained in the museum. The survey of both cultivated and wild medicinal plants of India was undertaken and the results are being worked out systematically. The increasing number of enquiries from Provincial Governments, Indian States and private individuals indicate their interest in the cultivation of medicinal plants; of particular note is *Chrysanthemum Cincrarialfolium vis* (grown in Kashmir) which has given promising results and is being further investigated. A paper entitled "A note on the collection and cultivation of medicinal plants" containing a list of plants whose cultivation is likely to be beneficial was published in the Agriculture and Livestock in India.

The number of poisonous plants discovered is now about 700 and the botanical, chemical and pharmacological aspects of these are being, systematically studied and worked out, with a view to publish them in a book form. A large number of medicinal and poisonous plants were chemically analysed and physiologically investigated with the co-operation of the Indian Research Fund Association and the staff of the School of Tropical Medicine. Investigations in connection with the role of rice and mustard oil in the production of epidemic dropsy were continued in collaboration with the Department of Bacteriology. The problem is being attacked from two points of view (1) the search for the infective agent, *e.g.*, virus and bacterial and (2) the role of rice and mustard oil. An examination of the mustard seed revealed the presence of adulterants as well as diseased seeds, and the Advisory Board has suggested that these adulterants should be studied and named.

ENCOURAGEMENT OF THE CULTIVATION OF MEDICINAL PLANTS AND DRUGS IN INDIA.

In February 1936, the Advisory Board examined a recommendation by the Drugs Enquiry Committee regarding the encouragement of the cultivation of medicinal plants and herbs in India and suggested that (1) enquiries be made about the state of demand in India for medicinal drugs, from medical store depots and the various *Ayurvedic* and *Unani* institutions and (2) a survey of medicinal plants cultivated by ryots be undertaken by the Provincial Governments. Provincial Governments were accordingly addressed and a mass of very useful information was received. This was referred to the officer in charge of the medicinal plants enquiry for examination and criticism and the entire material was printed up and submitted to the Advisory Board for consideration. It was decided that beyond the supply of the information collected further action of following up any promising lines of development be left to the Provincial Governments.

CHAPTER XIV.

MISCELLANEOUS AGRICULTURAL RESEARCH.

(i) Statistical Section, Imperial Council of Agricultural Research.

The technical staff consisting of the Statistician and his two Assistants was strengthened by the addition of a Computer, as the number of references to the Statistician involving statistical calculations showed a considerable increase during the year.

The section continued its main activities of scrutinising the technical programmes and progress reports of the several schemes under the Council. The services of the Statistician were availed of by most of the agricultural and veterinary research workers in the planning of experiments, and analysis and interpretation of the results.

The most important work completed during the year was the collation of all Sugarcane and Rice experiments conducted during the past five years both in Imperial Council of Agricultural Research Schemes and independently by Provinces and States. These results were reviewed by the Joint Committee on Field experiments of the Council which recommended a set of new manurial experiments to be adopted by the Provinces and States. The Statistician has since circulated designs for these experiments. These standard experiments recommended by the Council have been started in most of the rice and sugarcane experimental stations from the current season.

References to the Statistician from Provinces and States seeking statistical advice and assistance on matters connected with agriculture and animal husbandry numbered 243 during the current year as compared to 112 in 1937-38.

At the request of the Director of Agriculture, Punjab, tea experiments in the Punjab were planned and designed by the Statistician.

The Statistician visited Meerut to study the data regarding amounts of water supplied from a tube-well in connection with a proposal for experiments on the water requirements of crops.

The Statistical Section also helped in completing the statistical calculations in connection with the Cost of Production Enquiry.

(ii) Scheme of Statistical Studies (Professor P. C. Mahalanobis).

I. *Theoretical and Applied Researches.*

(1) Work on D^2-Statistics was continued and the distribution of the Studentized form studied.

(2) The theory of Galois fields and associated finite geometries was applied to Hyper-Graeco Latin Squares for numbers which are primes and powers of primes.

(3) Some new solutions have been obtained for balanced incomplete blocks.

(4) Work on graduation of empirical frequency curves involving Bessel Functions is in progress.

II. *Training Work.*

About fifty officers and post-graduate students received training in the Statistical Laboratory in modern statistical methods as applied to biological and agronomic research, sampling surveys and various other fields of study.

III. *Statistical Enquiries and Advisory Work.*

A large numer of scientific enquiries relating to the application of modern statistical methods to practical problems in biology, agronomy, sampling surveys and other subjects were received.

(iii) AGRICULTURAL METEOROLOGY.

During the year 1937-38 the Section continued its fundamental researches. It also maintained liaison between meteorology and agriculture by (1) co-operating with agricultural research workers in India and advising them on the meteorological aspects of their investigations and (2) devising and arranging the issue of a useful system of warnings and forecasts in collaboration with the All-India weather forecasting centre at Poona. The latter has worked usefully in the Bombay Presidency where the question of placing the system on a permanent footing is under consideration.

The investigations on the various processes involved in the disposal of solar radiation and rainfall at the surface of the ground were continued at the Central Agricultural Meteorological Observatory. Amongst other new investigations may be mentioned those on the capillary rise of water through the soil from the water table below, transpiration from plants, the exchange of water vapour between soils, plant materials, seeds, etc., and the surrounding air layers. The facilities for experimental work were further improved by addition of a neighbouring plot given by the authorities of the Poona Agricultural College to the grounds of the laboratory.

Two new instruments devised during the year were (1) a simple percolation gauge and (2) a sensitive and robust portable galvanometer. The latter is proving very useful for the measurement of plant, soil and air temperatures under field conditions.

On the statistical side special attention was devoted to the sampling studies on the growth and yield of crops both at Poona and at a few other centres. The analysis of the daily rainfall during May and June over a number of areas along the west coast of the Peninsula during the past sixty years was continued in connection with a study of the mode of onset of the South West monsoon. Further work on the computation of the frequency of heat waves was continued.

During the period 1932—38, the staff and students have published 60 original papers and notes dealing with the various aspects of agricultural meteorology and allied problems.

(iv) AGRICULTURAL ECONOMICS SCHEME (GOKHALE INSTITUTE OF ECONOMICS AND POLITICS, POONA).

This scheme started in February, 1937. A general survey for collecting material from land records such as acreage under various crops, sources of irrigation, and a live-stock census was undertaken in 23 out of

39 selected areas; 20 to 40 holdings were selected for each village. The cultivators filled up forms giving information required by the investigators. Details relating to items such as marketing of farm yard produce, supply of fodder and pasturage, feeding requirements of livestock, local weights and measurements, and prices at the local weekly markets, were also collected.

These are at present being collated and a final report from the Institute is awaited.

(v) Cultivation of Pyrethrum in India.

The pyrethrum plant is well known for its valuable insecticidal properties and especially for its use in anti-malarial work. Although attempts have been made in the past to cultivate it at various centres in the Punjab, North-West Frontier Province and Kashmir, the efforts made were not of an organised character. At the instance of the Indian Research Fund Association the question of the possibility of cultivating the plant in India was further discussed by a special Committee of the Advisory Board in January 1937 as a result of which it was decided to arrange for a co-ordinated experiment in suitable areas to find out if the cultivation of pyrethrum was an economic possibility. The Imperial Council of Agricultural Research arranged to obtain some seed of the plant through the Director of the Plant Pathological Laboratory in England and distributed it for trials in selected centres in Madras, Bombay, United Provinces, Punjab, Bihar, Sind, North-West Frontier Province and Kashmir. Co-operation of a few private individuals was also sought in these trials. While the seed failed to germinate in certain places (*e.g.*, Kanke, Poona and Sind), the results obtained in a few other places namely, Murree, Kashmir and the North-West Frontier Province were hopeful. The plant on the whole grew well on an elevation of 5,000 to 6,000 feet. The Advisory Board concurring with the views of the Entomological and Pathological Committee suggested that further experiments should be carried out on field scale.

(vi) The fumigation of plants in India.

With a view to improve the fumigation arrangements at sea-ports for plants imported into India the Advisory Board, in January 1937, recommended that the Imperial Entomologist should prepare a review of the existing methods and make suggestions for its improvement. In a subsequent meeting the Advisory Board considered the note prepared by the Imperial Entomologist and accepted the suggestions made by him for the improvement of the technique of fumigation. As regards the organisation required, the Board considered that at each port there should be a Plant Pathologist trained in entomology and mycology for inspection of plant material and supervision of proper fumigation and other treatments. These recommendations have been passed on to the Government of India for consideration.

(vii) Clove Enquiry.

In paragraph 25 of the last report, a reference was made to the enquiry undertaken by the Council into the possibility of clove production in India and to the publication of the Special Officer's report as Miscellaneous Bulletin No. 20 of the Imperial Council of Agricultural Research. The

Special Officer's recommendation was that before launching into clove plantation on a large scale, more knowledge should be gained from well-planned experiments and that towards this end the Council should arrange for carrying out a series of co-ordinated experiments in Madras, Travancore and Mysore and for an adequate supply of clove seed. Such experiments were required on—

(1) nursery practice including the raising of seedlings and the possibilities of vegetative propagation; (cutting, layering, grafting, budding, etc.);

(2) plantation practice including transplanting, spacing in the field, care of young plants, inter-crops and inter-culture, manuring, and the taking of the first and succeeding crops;

(3) protection of the plants in the field against pests and diseases.

He also recommended that additional information should be obtained in the meanwhile from existing plantations especially regarding actual yields.

A rough outline of the procedure that might be adopted for implementing these recommendations was submitted to the Advisory Board in November 1938. The proposals included suggestions for ensuring an adequate supply of seed and seedlings for the experiments, and a general programme for the cultivation experiments keeping in mind the practical object of the experiments. It was suggested that if the Governments of Madras, Travancore and Mysore were prepared to co-operate in the scheme, they might be asked what facilities in the way of land, labour and equipment they could provide and a suitable design of identical experiments to be carried out by the three Governments could then be designed by the Agricultural Commissioner with the Government of India, in collaboration with the Directors of Agriculture concerned. It was understood that as the idea was to utilise existing facilities and resources, the Departments concerned could themselves finance the experiments contemplated. The Advisory Board approved these proposals and the matter is now under consideration in consultation with the Governments of Madras, Travancore and Mysore.

(viii) Electrical Method of Hygrometry.

Reference has already been made in the earlier reports to the investigations by Prof. J. B. Seth of the Government College, Lahore, on devising an electrical method of hygrometry, with the aid of a small grant by the Imperial Council of Agricultural Research. The genesis of these investigations lay in the observation made by the staff of the Physics Laboratory of the Government College, Lahore, that the resistance of a carbon line drawn on the surface of an insulator depended on the humidity of the air surrounding it and it was considered that if a system of hygrometry could be devised based on this effect, it might prove useful to agricultural workers who require to determine humidities prevailing, for instance, inside a heap of agricultural products or immediately surrounding a leaf, etc. The final report on the subject was considered by the Advisory Board at its meeting held in May 1939 wherein it was noted that the investigation had yielded only negative results.

(ix) DESCRIPTION OF CROP-PLANT CHARACTERS AND THEIR RANGES OF VARIATION.

The need for evolving a system of description of crop-plant characters by which workers in different parts of the country could compare their varieties was stressed in a note presented at the meetings of the Botanical Sub-Committee and the Advisory Board held in July 1936.

The Sub-Committee which considered this question of studying the range of variability approved the suggestion that the survey of plant breeding material should be viewed rather as a problem in applied genetics than taxonomy and recommended that this new method be adopted by plant breeders in different parts of India. The Committee agreed that the best way was to appoint a small committee for each crop to collect information regarding the range of variability in all characters which it was proposed to measure and to publish that information in some suitable form. The Committee also decided that it was undesirable to attempt to do this kind of work on all crops at once and recommended that cotton and rice be taken up first and when schedules of these two crops are published the question for other crops might be taken next. As a result of these recommendations of the Sub-Committee which were approved by the Advisory Board two committees, one on cotton and the other on rice, were constituted. These committees prepared the schedules for their respective crops showing the range of variability in characters of these two crops. The reports of these two committees are published as "A Description of Crop Plant Characters and their Range of Variation—(1) The Variability of Indian cottons, and (2) The Variability in rice"—in the Indian Journal of Agricultural Science, Vol. VIII, Part 5, October 1938.

This new method has much to commend itself and has received universal approbation. It is, proposed to pursue it further in the case of wheat and other crops.

(x) STANDING SUB-COMMITTEE ON FIELD EXPERIMENTS.

At its first meeting held in 1935 the Crops and Soils Wing of the Board of Agriculture and Animal Husbandry in India adopted the report of a Sub-Committee on the 'Planning, technique and interpretation of field experiments' which recommended *inter alia* that (1) a Standing Advisory Committee of the Imperial Council of Agricultural Research be established to co-ordinate all research work on the technique of field experiments including standardisation of methods of statistical analysis and the adoption of a standard form for stating results of field experiments; (ii) this Committee should take the initiative in recommending the publication, on a scale allowing of distribution to workers, of pamphlets, text books and mathematical tables likely to be of use to workers in India.

The Advisory Board at its meeting held in January 1937 approved of the constitution of a small consultative body called the Standing Sub-Committee on field experiments for the purpose.

2. A joint meeting of this Committee and of an *ad hoc* Sub-Committee on Manurial Experiments was held on the 21st and 24th November 1938. A list of the enlarged personnel is given in Appendix V. The replanning of rice and sugarcane manurial experiments as a result of Sir John Russell's

recommendations formed an important part of the discussion. A short paragraph on this subject is given separately in the report. (See page 73).

(xi) Central Fodder and Grazing Committee.

The second meeting of the Committee was held in November 1938. A summary of the more important items discussed is given below:—

(1) The bibliographies on (*a*) Indian grasses, grasslands and fodder trees, (*b*) erosion and (*c*) experiments in feeding tests, were examined and it was decided that the bibliography on erosion be published as a Miscellaneous Bulletin of the Imperial Council of Agricultural Research and the other two bibliographies in *Agriculture and Livestock in India*. Action had been taken accordingly and the bibliography on erosion has already been published.

(2) The estimate of the amount of animal food available from all sources in India which was also prepared at the instance of the Committee was examined. It was decided that it should be revised to include average figures for the last five years in order to obtain approximately correct figures.

(3) The possibility of introducing cheap fencing in grazing areas, particularly a suitable live fence, was also considered. The Committee agreed that *Euphorbia Royleana* and *Euphorbia neriifolia* were worth giving a trial as live hedges, in those places where they were not yet used. The relative merits of a few other plants, *e.g.*, *Prosopis juliflora*, *Acacia siamea*, and the common bamboo, as live hedges were also discussed and the committee recommended that experiments which should include cost of management in the growing of these plants should be carried out wherever feasible.

(4) The best method of harvesting and storing grass in heavy rainfall areas, *e.g.*, Assam and the Bombay Konkan, was discussed and it was decided that reports from different stations where silage making from grass was in progress should be obtained and the information thus collected should be published in *Agriculture and Livestock in India*.

(5) The question of the collection of results obtained by the introduction of controlled and rotational grazing was also considered and it was recommended that since Fodder and Grazing Committees had been constituted in a number of Provinces, the results of investigation on this subject might now be written up in the form of short articles and submitted to Council for publication in the *Agriculture and Livestock in India*. It was also agreed that wherever data from outside India with possible application to India were available they might also be sent for publication.

(6) In considering simple methods of preventing or reducing erosion in grazing areas, the Committee expressed the desirability of conducting more experiments on contour-bunding and on contour-trenching to reduce run-off in grassland areas.

The Committee also recommended the following two schemes on grassland research. The recommendations of the Committee were approved by the Advisory Board:—

1. Scheme for research on the improvement of grassland by rotational system of grazing and the ecological study of forest grasses, by the Government of Bombay.

2. Scheme for research on the Fodder and Grazing problems in the United Provinces.

Provincial Fodder and Grazing Committees have so far been established in six provinces, *viz.*, Madras, Bombay, United Provinces, Punjab, Assam and North-West Frontier Province and the Baroda State. Their establishment in other Provinces is under consideration. The Government of Bengal have set up an Animal Husbandry Board which is expected to co-ordinate with the Central Fodder and Grazing Committee.

CHAPTER XV.

ANIMAL HUSBANDRY (GENERAL).

(i) His Excellency the Viceroy's Cattle Improvement Drive.

In the last year's report, an account was given of the measures initiated as a result of H. E. the Viceroy's appeal as regards the paramount necessity for effecting a general improvement of cattle in this country. The position was reviewed by the Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry at their meeting held in February 1939.

(ii) Donations of Pedigree Bulls and money.

The replies received from the Provinces show that the total donations till the end of March 1938, were as follows:—

Donation of Animals. 1,357 Bulls—

Cash Donations— { Rs. 2,95,000 for purchase of bulls.
Rs. 25,500 for maintenance of bulls.

Out of the money donations, a number of additional bulls was purchased or maintained in villages under the premium system.

In order to ascertain the exact position about the total number of gift bulls now in service, the Council have again made inquiries from provinces recently.

(iii) Village enquiry regarding cattle and the production and consumption of milk.

Mention was made in the previous report of the important findiugs under this scheme. During the year under review, the report of the scheme was published as Miscellaneous Bulletin No. 22 of the Imperial Council of Agricultural Research, priced for sale. The recommendations made by the Advisory Board of the Council after consideration of the results of the enquiry are included in this Bulletin.

It can be obtained from the Manager of Publications, Civil Lines, Delhi, on payment of Rs. 3-8 including packing and postage.

CHAPTER XVI.

THIRD MEETING OF THE ANIMAL HUSBANDRY WING OF THE BOARD OF AGRICULTURE AND ANIMAL HUSBANDRY AND ITS RECOMMENDATIONS.

The third meeting of the Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry was held in New Delhi in February 1939. The Conference was opened by the Hon'ble Kunwar Sir Jagadish Prasad, K.C.S.I., C.I.E., O.B.E., Member of His Excellency the Viceroy's Executive Council, in charge of the Department of Education, Health and Lands, and was attended by a large number of official and non-official representatives from different parts of India. Mr. M. Crawford, Deputy Director of Agriculture, Ceylon, attended the meeting on special invitation. The discussion embraced several important matters, such as animal diseases, mixed farming, fodder and grazing, animal nutrition and dairying. The full report of the meeting is being published separately by the Council and the recommendations made by the Board will in due course be communicated to the Provinces and States for such action as may be considered necessary. A brief account of the important findings of the Board is given below:—

(i) *Practical methods for the improvement and control of grasslands.*—The question of grassland improvement must be looked at as a part of the whole system of land conservation improvement which naturally leads to soil conservation. Keeping this in view, the Board adopted the following resolution:—

> "The Board notes with satisfaction the various efforts that are being made in Provinces and States towards the improvement of grasslands and recommends that these should be extended and intensified and linked up with all other movements towards soil conservation and planning for better land use. Further that Local Governments be invited to consider the desirability of taking legislative powers, where necessary, for enforcing the proper utilisation of grazing areas and waste lands capable of producing fodder or fuel."

(ii) *Fodder production with special reference to mixed farming.*—It appears that the fundamental principles of mixed farming have so far been very sadly neglected in so far as there are no immediate results to be seen, and improved seed alone cannot show good results on poor land. Further, it is observed that the more the cattle are worked as part of an economic farm, the better will be the return from crops. As the question of mixed farming was one of fundamental importance, it seems likely that small grants for well planned experiments in provinces may be sanctioned from the Council's funds.

(iii) *Fodder tree with special reference to flooded areas.*—During the monsoon there is a great scarcity of fodder in flooded areas in the Provinces. When the rivers are in spate the cultivated areas, intermittently and for fairly long stretches, go under water. The cattle population of entire villages have then to depend for their existence on what little vegetation they can find on the village high lands. To solve this problem it is necessary to study whether fodder trees can be cultivated profitably. As very little information is available on the subject it was decided to

compile the available information and publish it in the Council's Journal 'Agriculture and Livestock in India.'

(iv) *Establishment of Provincial Livestock Associations and Cattle Improvement Funds.*—On this important subject the following resolution was adopted:—

> "The Board desires to emphasise the value of properly organised cattle shows. It notes with satisfaction that the Central Government has provided finance for the All-India Cattle Show for a term of years and that a Show Society has been registered. District and local Shows are of the greatest importance and the Board recommends that Local Governments should ensure adequate provision for the organisation and holding of such shows and for substantial prizes."

(v) *Measures to be adopted in India in order to comply with international requirements regarding the examination of animal products for export.*—India's export in animal products is considerable. The importing countries demand, however, that these products should be certified by competent authorities in India as fit for export. This is necessary in order to create confidence in international markets and also for the expansion of this important trade. The Board examined the problem thoroughly and passed the following resolutions:—

"(1) So far as possible all animals slaughtered for human consumption should be slaughtered in public slaughter-houses and the animals subjected to anti and post-mortem examination by a qualified Veterinary Assistant Surgeon.

(2) For this examination all local bodies must employ qualified Veterinary Assistant Surgeons as Superintendents of slaughter houses.

(3) All animals slaughtered at the slaughter-house must be certified by the qualified Veterinary Assistant Surgeon as free from contagious diseases at the time of slaughter.

(4) Bales of hides and skins should be marked in some way to indicate their source of origin and date of slaughter.

(5) Periodical information regarding the incidence of diseases throughout India, infected areas and the dates from which areas are declared free, should be furnished confidentially to the Veterinary authorities at the ports serving those areas.

(6) A considerable tightening up of the system of reporting outbreaks of contagious diseases among livestock by the local reporting Officer is required.

(7) The introduction of legislation for the control of contagious diseases of live-stock is essential so that outbreaks can be quickly suppressed."

(vi) *Pleuro-pneumonia of goats.*—The problem of combating the disease is of great importance from the point of view of export trade in goats. The rearing of goats in certain areas is becoming difficult owing to the ravages of this disease. The problem has, however, engaged attention only recently and in the absence of adequate information the Board was unable to make any specific recommendation. It was agreed to take up the investigation with particular reference to its correlation to Haemorrhagic Septicaemia.

(vii) *Control of Johne's disease.*—The disease has assumed a position of major economic importance as from the information available it

appears that it occurred in almost all dairies in India. Investigation on the disease is being carried out in various parts of the country, particularly at the Imperial Veterinary Research Institute, Mukteswar and in Mysore. The Board recommended that:

"(1) Further investigation as to the incidence of the disease in the villages is necessary.

(2) The question of the disposal of positive reactors should form the subject of future discussions, as slaughter of such animals is impracticable.

(3) Diagnostic tests are at present not very reliable but the Double Intradermal test may be continued and it should always be confirmed by faecal examination."

(viii) *Surra in horses and cattle.*—On this subject the following resolutions were adopted:—

"(1) That the investigation of bovine surra should be included as an item of special importance in future programmes of work of the Veterinary Investigation Officers in India.

(2) That in view of the high cost of 'Naganol' an investigation should be undertaken to explore the possibilities of less expensive drugs in the treatment of surra, and that, if necessary, efforts should be made to secure the collaboration of one or more leading firms of chemists in this connection.

(3) That in the meantime the Bayer Company should be addressed concerning the possibility of reducing the price of 'Naganol' so as to bring the drug within the reach of the average stock-owner in this country.

(4) That a series of intensive investigations should be undertaken to determine (*a*) the minimum effective dose of 'Naganol' in the prophylactic treatment of equine surra; (*b*) the relative therapeutic value of 'Naganol' *cum* 'Tartar-Emetic' method in the treatment of both acute and chronic cases of this condition.

(5) That in those areas where surra is prevalent, surveys should be undertaken in collaboration with the Mukteswar Institute, on the likely blood-sucking *arthropods* with a view to ascertaining the species of the vectors involved in the spread of the disease. In the meantime, measures should be taken, in selected surra areas, for the destruction of the egg clusters of Tabanids, which are believed to be common vectors of the disease."

(ix) *Theileriasis of Cattle.*—As this subject had come into prominence very urgently, it was felt that any conclusion that emerged from the discussion would be only of a tentative character. Little information is available at present concerning the extent to which bovine theileriasis represents a disease entity of major importance in this country. The following resolutions were passed by the Wing on the subject:—

"(1) That the Veterinary departments of the provinces and Indian States should be invited to collaborate with the Mukteswar Institute in regard to the investigation into the incidence of bovine theileriasis in India by forwarding to that Institute blood and gland smears from animals that have succumbed to or recovered from blood-borne protozoan infections.

(2) That there is need for a series of controlled cross-immunity tests to determine the relationship between East Coast Fever and acute forms

of theileriasis in India but that these tests should be carried out in a locality where East Coast Fever is definitely known to be prevalent.

(3) That in the matter of experimental work on the treatment of acute theileriasis special attention should be given to those compounds of the Sulphanilamide group which are of proved efficacy for cerain analogous disease conditions in the human subject."

(x) *Warble fly.*—The following resolution was passed on the subject:—

> "The Board is greatly impressed by the damage caused to hides by ticks in India and recommends that the Imperial Council of Agricultural Research should take up the question of further research with special reference to distribution, periodicity and the stage of the tick when damage is caused."

(xi) *Supply of breeding bulls with special reference to H. E. the Viceroy's gift Bull Scheme.*—In this matter the Animal Husbandry Wing recognised the difficulties and the expense attendant on rearing good dairy bulls and recommended that all agencies which could, in the opinion of the Livestock Department, be profitably employed on this work should be subsidised. It was also recommended that all possible agencies should be employed to facilitate the production of pedigree bulls for milch and draught, and draught only. During the course of discussion it was pointed out that much harm could be done by indiscriminate presentation of bulls which were possibly unsuitable for the cattle of the locality. The Board recommended therefore, that to avoid indiscriminate location of bulls, all donors under the Viceroy's Gift Bull Scheme should be informed that the selection and location of bulls purchased from such donations should be controlled by the Livestock Department or by the Cattle Improvement Society where such exists.

(xii) *Formation of breed societies.*—The Animal Husbandry Wing considered that if Herd Books and registration of Indian breeds of cattle were to be made a success, it was essential that *breed societies* should be formed to work in the interests of breeds. The Board observed that the characteristics of a number of grey breeds of cattle had not yet been scientifically studied and defined and recommended that the Imperial Council of Agricultural Research should be requested to undertake the work. Further the Board considered that it would be advantageous if final selections of these types could be shown at the All-India Cattle Show at the end of the enquiry. The Council has already initiated action on this recommendation.

(xiii) *Salvage of dry city milch stock and supply of milk to large cities.*—After a detailed discussion on the problem the Animal Husbandry Wing considered that a special small committee of people, closely associated with the subject, should be appointed to investigate the question on the spot at the three Presidency towns and endeavour to elucidate a course of action which would be assented to, and co-operated in, by the authorities concerned.

(xiv) *Horses, Mules and Asses.*—A note on the improvement of indigenous breeds of horses prepared by the Council was discussed by the Wing. It was agreed that efforts should be concentrated on the improvement of indigenous breeds rather than on cross-breeding or introduction of foreign breeds. As a first step towards this goal, it was thought necessary that breed characteristics should be defined as was done in the case

of cattle. It was suggested that the provinces and States should prepare a note regarding their own indigenous breeds and send it to the Council in order to enable them to see whether something concrete could not be done for the improvement of horses along the lines suggested. At the instance of the Council, a circular letter was accordingly addressed by the Government of India in the Education, Health and Lands Department to all Provincial Governments and States. In response to this, two schemes for the improvement of Bhutia and Manipuri ponies were received from the Governments of Bengal and Assam, respectively. These schemes were considered by the Advisory Board and referred back to the provincial governments for modification in certain respects.

An attempt is being made to get information about the various breeds of asses in India and the information when obtained may be published in one of the Council's journals.

(xv) *Natural outbreaks of rinderpest in sheep and goats and their bearing on the general problem of control of this disease.*—It was observed that goats and sheep were generally refractory to natural rinderpest infection but the indications were that outbreaks did occur amongst these animals. There was evidence to show that infection could be transmitted by cattle to sheep and goats. As the subject was in the early stages of investigation the Wing was of the opinion that it should be actively pursued.

(xvi) *Control of Doyle's (Ranikhet) disease in India.*—This disease had been under investigation for many years in other countries but the results obtained so far had not been satisfactory. From observations made in this country it appears that the disease is almost as serious as foot-and-mouth disease in England. As in the case of foot-and-mouth disease, the carrier problem has to be considered and the only method of control may be by a wholesale destruction of the affected birds and splitting up the rest of the flock in small groups to locate them apart from each other for application of rigorous measures of disinfection. Potassium Permanganate in water is likely to be a good disinfectant. One source of the spread of disease is transport by the railway and it would be desirable to undertake an investigation into this aspect. Further, the control of all poultry diseases is very largely facilitated by the construction of proper poultry houses and this factor should be borne in mind. Whenever any suspicion arises in regard to diagnosis, the case should be dealt with as that of Ranikhet disease and necessary precautions should be taken accordingly.

The conclusion therefore was that, until further knowledge is gained, the best method of eradicating the disease would be the destruction of the affected birds and the segregation of the unaffected ones. The methods best suited to a locality should be broadcast to everybody so that steps might be taken to control the disease as far as possible. It was considered necessary also that all available information in regard to diagnosis, prophylaxis and treatment of the disease should be collected and made available to all interested through the Council's journal.

(xvii) *Correlation between soil deficiencies, poor cultivation, unthrifty cattle and human malnutrition.*—This subject had also been discussed in the Standing Animal Nutrition Committee of the Indian Research Fund Association, and the deficiency diseases in the Kangra Valley were

particularly discussed. The first stage of the surveys showed that deficiency diseases existed in human beings and animals.

The problem which required further investigation was whether the deficiency of the cattle was due to semi-starvation or any definite deficiency. A more detailed study of the condition of cattle was necessary in order to find out if the deficiency diseases of human beings were not to some extent reflected in the cattle of the valley.

It is clear that human malnutrition in Kangra Valley is due to unsatisfactory system of agriculture which leads to insufficient supplies of animal products (milk). Whether there is any direct relationship with calcium or other deficiency seems doubtful. It is also clear that one cannot say all is well because the analysis of fodders shows no calcium deficiency. It was considered necessary that the Veterinary Investigation Officers should keep in close touch with Mukteswar in regard to the investigation of these obscure problems.

(xviii) *Migration of cattle between provinces and states with reference to its effect on* (a) *the control of contagious disease,* (b) *the breeding of pure stock.*—Rinderpest is one of the diseases which is transmitted through movements of cattle. Among the other diseases which may be transmitted by migratory cattle is contagious abortion. In order to control the spread of the disease, it was suggested that prophylactic measures should be adopted, the movement of cattle should be completely stopped and quarantine stations should be set up. It was also suggested that the control of diseases like haemorrhagic septicaemia required some effective legislation and unless there was simultaneous action in all the provinces and states no progress could be made. One practical solution would be to make the owners of cattle to rail them to the place of sale. The spread of disease may also be prevented, if the cattle in big cattle fairs are inoculated and dipped.

As regards the position in regard to central legislation, both the Animal Husbandry Wing at Madras and the Advisory Board discussed the question of a central Act for the control of contagious diseases. The question is under the consideration of Government at the present moment. It is a question for consideration whether anything may be done by way of restricting the movement of diseased cattle by the existing well defined routes, *e.g.*, the route from Hissar, Rohtak, Gurgaon, passing through the Provinces of Delhi, United Provinces, Bihar, reaching down to Calcutta and similar five regular routes in the Bombay Presidency.

There should be closer co-operation between Provinces and the Indian States if any effective measures are to be adopted to control these contagious diseases. At the present moment, information, passing through usual official channels, came in the hands of the proper officer concerned much too late for any effective action to be taken. At the present moment the rules, as they stood, prevented correspondence direct between the Veterinary Officers concerned in a State and a Province.

The Wing was unanimously of the opinion that arrangement should be made for direct exchange of information between province and province, and provinces and States regarding outbreaks of contagious diseases of cattle.

(xix) *Review of the progress made in provinces and States as a result of H. E. the Viceroy's cattle improvement drive.*—[Please see Chapter XV, paragraphs (i) and (ii).]

CHAPTER XVII.

OTHER ANIMAL HUSBANDRY MATTERS.

A.—Animal Pests, Diseases and Cure.

(i) *Control of disease amongst livestock.*—Central legislation in regard to this matter is still under examination by the Government of India.

(ii) *Central Veterinary College.*—It was stated in the previous report that further action regarding the establishment of the Central Veterinary College was being taken by the Government of India. In view, however, of the unfavourable financial outlook, the Government of India have decided to drop the question of financing the scheme for the present.

B.—Dairying and Cattle Breeding.

(i) *Pedigree Registration and Establishment of Herd Books.*—The importance of pedigree registration and milk recording in connection with the improvement of livestock in India has been stressed in the previous report. The subject has been discussed from time to time at meetings of the Standing Cattle Breeding Committee, the Advisory Board and the Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry in India. It was realised that cattle breeding is a provincial subject; but there are breeds which are of importance either to all India or to more than one province and for such breeds it was considered essential that Herd Books should be kept at the centre in collaboration with the Provinces and States concerned. At their meeting, held in August 1936, the Governing Body of the Council, however, decided that as a preliminary step to the establishment of Herd Books for eight breeds of milch cattle of all-India importance, steps should be taken to define their characteristics and to publish the details in that connection. The procedure adopted for the definition of breed characteristics was to appoint a Convener for each breed who was expected to visit the important breeding tracts of particular breeds, convene meetings of the prominent breeders and prepare a schedule of points in consultation with them. The breeds chosen for the purpose were (1) 'Tharparkar'; (2) 'Red Sindhi'; (3) 'Gir'; (4) 'Sahiwal'; (5) 'Kankrej'; (6) 'Ongole'; (7) 'Hariana'; and (8) the 'Murrah' buffalo. The reports submitted by the Conveners were collated in the Council and utilised in the preparation of a Brochure on the subject. The Brochure was considered by the Standing Animal Husbandry Committee in November 1938. The Committee suggested certain additions and alterations in respect of the definitions, etc., of all the breeds mentioned above. As regards the 'Tharparkar' breed, however, further examination was considered necessary. New Conveners have accordingly been appointed to define afresh the breed characteristics of the 'Tharparkar' Breed. The definitions of the breed characteristics of the other 7 breeds, as modified by the Standing Cattle Breeding Committee, have been published in the form of a Miscellaneous Bulletin (No. 27) of the Imperial Council of Agricultural Research.

A scheme from the Government of the Punjab for starting Herd Books and Pedigree registration for the Hariana breed of cattle was received and considered by the Advisory Board of the Council at their meeting held in November 1938. They recommended a grant from the Council to meet the salaries of stockmen, contingencies and travelling allowance for a period of three years in connection with scheme. They further recommended that with a view to encouraging registration work, including

milk recording, the Council might make similar grants to other provinces in respect of other breeds. The matter will be submitted for consideration by the Governing Body when they next meet.

(ii) *Adulteration of dairy products.*—It was stated in the previous report that a set of model rules was prepared on this subject for circulation to the Provinces and States. These rules were considered by the Standing Dairying Committee of the Council who made certain additions and alterations. These draft rules, as now modified, are being examined by the Public Health Commissioner with the Government of India, as the matter touches upon the public health aspect on a number of points.

(iii) *Milk supply in Calcutta and Cawnpore.*—The matter as regards investigation into the question of milk supply in Calcutta has since been dropped so far as the Council is concerned. The Calcutta Corporation, who have since re-examined the position, are now investigating the problem themselves. At the request of the Cawnpore Municipal Board, the question of improvement of livestock and milk supply in Cawnpore City is, however, under the consideration of the Council at present.

(iv) *Definition of the breed characteristics of the Grey breeds of Cattle.*—As recommended by the third meeting of the Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry held in February 1939, a scheme for defining the characteristics of the grey breeds of cattle has been prepared by the Animal Husbandry Committee and approved by the Advisory Board and it will be considered by the Governing Body of the Council in due course.

It is proposed to utilise the services of two expert officers, who have very intimate knowledge of cattle breeding in this country, for a period of nine months. The Advisory Board, while recommending the scheme, decided that the three breeds, *viz.* Ongole, Krishnavalley and Malvi should be dealt with in the same manner as the more important milch breeds whose characteristics have already been defined and published. The breeds to be studied by the two expert officers are Gaolao, Mewati, Rath, Nagori, Hissar-Hansi, Bhagnari and Dajal. The object of the scheme is to lay down an agreed type for each which the breeders who wish to maintain purity and market value can breed to. It is also proposed to examine as to which of these types is it really worth while developing.

(v) *Definition of the breed characteristics of certain other breeds of cattle.*—Applications have been received for grants from Bombay and the Punjab for studying the characteristics of the Soorti, Pandharpuri and Nili-Ravi buffaloes and Dangi, Khillari and Dhanni breeds of cattle. Proposals for taking urgently the work on Soorti and Nili-Ravi buffaloes and Khillari and Dhanni breeds of cattle with a view to publish a bulletin on these breeds by February or March 1941 are being submitted to the Governing Body of the Council. The Hyderabad Government have generously offered to co-operate in this scheme at their own cost in respect of the Deoni breed.

(vi) *Affiliation of the Council to the International Dairy Federation.*—At their meeting held in March 1938, the Standing Dairying Committee of the Council discussed the report of the delegates from India on the proceedings of the Eleventh World Dairy Congress held at Berlin in August 1937 and it was agreed that it would be advantageous for India to become a member of the International Dairy Federation, especially as

a tropical dairying section of the world Congress had now been formed. In view of the fact that there were no associations of dairymen in India at present, it is proposed that the Council should join the Federation as a Society representing producers, as in the case of the Coffee and Tobacco Sections of the British Empire Producers' Organisation. The annual affiliation fee will be 1,000 Belgian Francs or a little over Rs. 100. Twenty-six countries, including the United Kingdom, are now represented on the Federation. The United Kingdom is represented on the Federation by the British Dairy Farmers' Association, which constitutes the National Committee for that country. The proposal is being submitted to the Governing Body of the Council. If approved, the Animal Husbandry Commissioner with the Government of India will function as the official correspondent for the Federation in India.

(vii) *Uniform system of Milk Recording.*—The modifications in the Forms, referred to in the previous Report, were approved by the Standing Dairying Committee and it was decided to have copies of the revised Form printed for free supply to those Dairy Farms or owners who intended to keep regular records and to co-operate with the Council by supplying records for publication.

C.—Animal Breeding (Sheep and Goats).

(i) *Production of Karakul Pelts.*—The question of undertaking research for the purpose of production of lamb pelts with the right type of curl for the trade in these skins was discussed by the *ad hoc* Sheep and Wool Committee and the Advisory Board at their meetings held in November 1937. A scheme for sheep-breeding with a view to the grading up of sheep for karakul pelt production has been received from the North-West Frontier Province Government and is awaiting the consideration of the Council.

(ii) *Sheep and Wool.*—In order to deal satisfactorily with problems connected with the breeding of sheep and the production of wool it was considered desirable to collect and collate information about the different breeds or types of sheep in India and the varieties of wool produced by them. A questionnaire has been accordingly issued to all the Provinces and the Constituent States of the Council, the main object of which is to ascertain the production, demand and market value of wool produced by each type of sheep with a view to planning a sheep breeding programme.

D.—Animal Nutrition.

Assam Animal Nutrition Scheme.—At their meeting held in July 1938 the Governing Body decided to finance the Assam Cattle Nutrition Scheme at a cost of Rs. 45,000 spread over a period of three years. The grant has been accepted by the Government of Assam and the details of the scheme are being worked out. The scheme is expected to start during the financial year 1939-40.

E.—Poultry.

Poultry Disease Investigation.—Under the auspices of the Council two poultry husbandry schemes—one in the Bombay Presidency and the other in the Punjab—are at present being worked. At their meeting held in November 1937, the Advisory Board emphasised, however, the fact

that under the present circumstances in India research into the diseases of the poultry was more important than poultry breeding. They also observed that in order to take full advantage of the Specialist Officer appointed for research on poultry diseases at the Imperial Veterinary Research Institute and in view of the fact that it was not possible for the existing Veterinary Investigation Officers to undertake this work in addition to their already heavy duties, an additional Investigation Officer was needed in each Province and Constituent state for research work into the diseases of poultry. The Provinces were accordingly asked to say what facilities they could provide for the purpose and invited to submit schemes on the basis of contribution by them of half the estimated cost.

Schemes were accordingly received from Madras, Bombay, the United Provinces, Bihar, Orissa and the North-West Frontier Province. The Advisory Board considered these schemes and recommended the adoption of a uniform scheme by each province at an estimated cost of Rs. 21,200 spread over a period of five years. The cost involved is to be shared equally by the Council and the Provincial Governments concerned. The schemes as revised by the Advisory Board have been accepted by five provinces but the Government of Orissa have intimated their unwillingness to proceed with the scheme. These schemes are awaiting the consideration of the Governing Body.

A scheme for poultry disease investigation work was received from Baroda also but as certain points required elucidation, the Advisory Board decided that the scheme should be referred back to the Baroda Government for further elucidation.

F.—Fish.

(i) *Review.*—At their meeting held in November 1937, the *ad hoc* Fish Committee of the Council discussed *inter alia* the question of the practical measures to be adopted for the development of the fishing industry in India. The Committee was of the opinion that in order to effect improvement it was necessary to carry out (a) local surveys of the amount and class of fish available and (*b*) systematic experimentation on small business scale with such improved methods of collection, transportation, and handling of fish as are available in the Country. Survey work on fish marketing under the direction of the Agricultural Marketing Adviser to the Government of India has already been started in the Provinces, etc., and a report thereon is expected by December 1939.

The Imperial Council of Agricultural Research have accepted schemes for the investigation of certain problems connected with the fishing industry and funds have already been provided for a small Scheme for the investigation of life history of certain fresh water fishes in Bengal. A larger Madras Scheme for the development of fishing industry in that Province has been approved, but funds are not yet available for it. During the year under review the Orissa Government submitted a scheme for carrying out biological investigations in the Chilka lake fishery described below and this is awaiting the consideration of the Council. It is not at present feasible for the Council to undertake general research on fisheries, though it is hoped that when funds permit it will be possible to render some assistance to rural pisciculture.

(ii) *Chilka Lake Fishery Scheme.*—The estimated cost of the Scheme is Rs. 81,500 spread over a period of two years. The investigations proposed to be carried out are on the following lines:—

(*a*) Collection of detailed qualitative statistics in regard to the actual quantities and kinds of fish that are captured in the lake.

(*b*) Distribution of fishes in the different parts of the lake in different seasons of the year, particularly in respect of the migration of the sea fish through the mouth of the lake.

G.—MISCELLANEOUS.

(i) *Scholarship in Animal Genetics.*—In pursuance of Dr. Wright's recommendation that the Imperial Council of Agricultural Research should award one of two scholarships to enable promising post-graduates to obtain training in Animal Genetics overseas, the Council sanctioned funds for the award of a scholarship for training in the United Kingdom. Dr. P. Bhattacharya, M.Sc., Ph.D., Acting Professor of Zoology, Cotton College, Gauhati, was selected for the grant of the scholarship on the recommendation of the Federal Public Service Commission. He left for the United Kingdom in March 1939 and his training is to last for two years.

(ii) *Apiculture.*—Reference had been made in the last year's report to the efforts made by the Council towards improving the bee-keeping industry in the Country. During the year under review, the Advisory Board considered bee-keeping schemes received from the Governments of Madras, Bombay, the United Provinces and Assam and recommended as follows:—

(*a*) A central bee-keeping organisation wholly financed by the Imperial Council of Agricultural Research is necessary. The first essential requisite towards this end is the recruitment of a suitably qualified officer to be sent abroad for special training. The organisation, which is estimated to cost Rs. 50,000, provides for one year's training abroad of the officer, one year of preliminary survey and three years of work. The selection of a suitable centre for the location of the central organisation and the technical programme of work will be decided by the officer concerned after recruitment.

(*b*) In conjunction with the central organisation, ten regional sub-stations should be established in different parts of the country at a cost of Rs. 12,000 per station spread over a period of five years.

(*c*) As the Madras Department of Agriculture has already been doing a considerable amount of useful work for a long time, in this matter the sub-station at Wyanad in the Madras Province should be opened early and the remaining sub-stations added as and when funds permit.

These recommendations are awaiting the consideration of the Governing Body of the Imperial Council of Agricultural Research.

(iii) *Improvement of Camels.*—Information regarding the various breeds of camels has been collected from the camel breeding provinces and States. From the information now available it is observed that the Punjab, Sind, Baluchistan and the Rajputana States (especially Jodhpur and Bikaner) are the main camel breeding centres. The breeding methods followed at most of these places are primitive and no attempt has hitherto been made to encourage systematic breeding of camels on scientific lines by any Province or State with the exception of the Punjab.

The population of camels in India is estimated to be about 11 lakhs. It is of sufficient economic importance to the cultivator to merit the attention of the Council. The Defence Department is also interested in the matter as a large supply of camels is necessary in war time. A note on the "Improvement of camel-breeding" is under preparation and will be submitted for consideration to the Cattle Breeding Committee of the Council.

(iv) *Mink Farming.*—Messrs. Combe Banks Mink Farm Limited, a well-known fur-producing firm of England, desired to investigate the possibilities of mink-farming in India. The enquiries conducted by the Council in this respect revealed that the industry had good prospects in the various hill stations in India and that the climate was quite suitable for the purpose. The firm have just established an experimental farm at Kotagiri, Madras and contemplate opening a few more stations in the near future at various hill stations in India.

(v) *Researches into ancient Indian Veterinary History by Mrs. J. F. Shirlaw.*—Some time back Mrs. J. F. Shirlaw, lately Professor Women's College, Lahore, asked for the assistance of the Council in regard to the collection of the ancient veterinary literature of India. The Council has provided her with all possible facilities including the procuring of photostat copies of ancient and obsolete books and manuscripts. It is expected that the work when completed will be of great interest and value.

(vi) *Insurance of cattle.*—In 1933, an enquiry was made whether the provinces had any system of insurance for cattle whereby the owner could pay a premium enabling him to obtain free veterinary service in addition to meeting the expense of covering and loss sustained by the death of the animal. The replies received to this enquiry showed that attempts had been made to start the system in the three Presidencies and in the Punjab but that they were not quite successful.

A further reference to Provinces on the subject showed that very little progress has been made in India in regard to the matter. The main obstacles seem to be (*a*) the low economic condition of cattle owners; (*b*) the low value of cattle and (*c*) the lack of an adequate organization for the control of contagious diseases. It may however, be possible in the near future to link up this question of insurance with that of pedigree registration and herd books which is now engaging the attention of the Council.

(vii) *Hides and Skins.* (*Flaying of hides*).—With a view to encouraging better flaying of hides by a reduction in the number of flay marks and cuts, the tanners in an informal conference with the Central Marketing Staff held at Cawnpore in July 1936 expressed themselves in favour of a system of paying premium to flayers for well-flayed hides. It was suggested that the system might be initiated at the experimental hide grading stations which were then proposed to be established by the Central Marketing Staff. A system of paying premium was accordingly adopted on the inauguration of the experimental hide grading stations at Agra and Delhi in November 1936.

When the system in question was started it was thought that the Tanners' Federation of India would provide funds for the payment of the premium; but for various reasons, the Federation could not give any contribution and the premium had to be paid from Government funds.

The question was discussed at the Tanners' Conference held at Cawnpore on the 14th February 1938. It was, however, decided that the Agricultural Marketing Adviser should approach individual tanners, shippers etc., asking them to contribute towards the expenditure in connection with the improvement of the quality of Indian hides.

In consonance with the above decision the Governing Body of the Council at their meeting held in July 1938, accorded administrative approval to a proposal for the creation under the Council of a Hide Improvement Fund, the proceeds of which would be utilised for purposes of effecting improvement in the flaying of hides in India. The main items of expenditure will be payment of premium to flayers on well flayed hides. It is also proposed to try out the mechanical flaying of hides and other improvements, should the funds permit to do so.

(viii) *Piggeries.*—It appears that increasing interest is being taken for the establishment and maintenance of Piggeries in India. A list of piggeries in India was accordingly complied and copies thereof were supplied to interested persons.

At the instance of the Council, an article has been prepared on "The rearing of Imported Pigs in India" which will shortly be published in the "Agriculture and Livestock in India".

(ix) *Cattle route map of India.*—The question of preparing a map of India showing the main routes of cattle immigration in India is engaging the attention of the Council. The information required in this connection is not yet complete. It is also necessary to consult the Cattle Survey Report of the Agricultural Marketing Adviser which is at present under preparation.

(x) *Imperial Veterinary Bureau, Paris.*—The Governing Body have sanctioned the continuance of India's contribution to the Bureau for another period of 7 years from May, 1938.

Col. Sir Arthur Olver, C.B., C.M.G., F.R.C.V.S., Principal, Royal Dick Veterinary College Edinburgh, late Animal Husbandry Expert to the Imperial Council of Agricultural Research, has been selected to represent India on the Committee for a period of 3 years.

(xi) *Exhibits relating to Livestock industries in India for display at the Indian Court, London.*—The show-stalls of the Imperial Institute, London, do not at present contain proper exhibits relating to the Livestock industries of India. In order to remove this long felt want, it has been decided to supply certain exhibits to the Institute for display. For the purpose, the Council have undertaken to collect (i) a series of photographs and material illustrating the three major industries of the Country, *viz.*, "Wool", "Dairying" and "Tanning"; and (ii) material required for setting up a large sized diorama, illustrating the Indian methods of "Tanning". The articles when collected will be sent to the Institute.

(xii) *Animal Husbandry Committees.*—(*a*) *Reconstitution of Standing Committees on the Animal Husbandry side.*—The Advisory Board and the Governing Body of the Council considered the question of reconstitution of the Standing Animal Nutrition, Cattle Breeding and Dairying Committees at their meetings held in March 1938 and July 1938, respectively. The Committees were reconstituted for a further period of two years. The composition of these committees as reconstituted is shown in Appendix VI.

The Bombay, Bengal, the United Provinces and Bhopal Governments have suggested certain changes in the personnel of the Committees. These are due for consideration by the Governing Body at their meeting to be held in July 1939.

(*b*) *Meetings of Standing and* ad hoc *Committees on the Animal Husbandry side.*—The following Standing and *ad hoc* Committees met during the year under review:—

(i) Standing Cattle Breeding Committee.
(ii) Standing Animal Nutrition Committee.
(iii) *Ad hoc* Animal Diseases' Committee.
(iv) *Ad hoc* Apiculture Committee.
(v) *Ad hoc* Helminthological Committee.

CHAPTER XVIII.

ANNUAL HUSBANDRY SCHEMES.

A.—Animal Pests, Diseases and Cure.

(i) *Veterinary Investigation Officers.*—During the year under review the following diseases were investigated by the Veterinary Investigation Officers in the Provinces and Hyderabad State:—

Anthrax, Bovine Abortion, Tuberculosis, Johnes disease, Doyle's disease, Horn cancer, Helminth infection, Foot and mouth disease, Surra, etc. These Officers also carried on experimental work on different diseases in collaboration with Imperial Veterinary Research Institute, Muktesar.

In the last year's report it was mentioned that in view of its great importance, the Council had recommended that this work should be taken over permanently by the Government of India. Pending a decision on the matter, the Council extended the scheme for one more year with effect from the 1st April 1938. Since, however, the Central Government declined to take it over during 1939-40 owing to financial stringency and other reasons, the Governing Body at their meeting held in July 1938, sanctioned the continuance of the scheme for one more year, that is up to 31st March 1940. The question will again come up for consideration at the next meeting of the Governing Body.

(ii) *Appointment of a systematic Protozoologist at the Imperial Veterinary Research Institute, Muktesar.*—The Council has financed a scheme under which Dr. H. N. Ray, M.Sc., (Cal.) Ph.D. (Lond.), was appointed to undertake the investigation into the bionomics of the various protozoa, connected with diseased conditions in the domestic animals, and their intermediary hosts. He joined duty at the Imperial Veterinary Research Institute, Muktesar on the 18th August 1936.

The following is the summary of his work for the period August 1936 to March 1938.

Instead of experimenting on the curative value of anti-theileriasis serum, investigation was made on the possibility of finding a suitable drug for combating the disease. Work in this connection is still in progress. Morphological studies of the parasite made so far indicate that *Theileria annulata* is specifically different from the common innocuous form occurring in this country. Morphological and toxonomic studies on *Tryparosoma evansi* were carried out during the period. In a relapse case of equine surra some of a typical form of *I. evansi* were observed in the peripheral blood smear of the host immediately before its death. Work on *Babesia bigemina* and Canine Piroplasmosis due to Babesia gibsoni is also in progress. The occurrence of *Bertouella canis* was reported for the first time in India in 1936 and an investigation of this has now been undertaken. During the period under review, an outbreak of an obscure type of disease characterised by symptoms largely simulating those of 'Nairobi Sheep Disease' occurred among sheep and goats in a breeding farm in the United Provinces. A strain of *Eimeria arloingi* was isolated from some of the affected animals and the pathogenicity of this strain was tested on a few healthy sheep and goats. The results however were of a negative nature.

(iii) *Indigenous drugs.*—The subject has, of late, attracted the attention of the press and the public and there is a growing popular demand for an enquiry into the efficacy and proper identification of Indian drugs. The subject has therefore, been under the consideration of the Council for some time past and the following schemes have been financed:—

(*a*) *Madras scheme for research into the indigenous drugs of India with special reference to their toxicology.*—In December 1937 the Governing Body allocated funds amounting to Rs. 44,000 spread over a period of three years for the working of this scheme. The scheme will start as soon as some preliminary details are settled. The programme of work provides for:—

(1) A scientific study of indigenous drugs of reputed efficiency and poisonous plants and in the case of those likely to prove of therapeutic use in veterinary practice, assessing their value and standardising the dose for large animals.

(2) Examination of the pharmacopical drugs and their allied species growing in India which are used in veterinary practice, in order to ascertain the possibility of employing them in place of imported drugs.

Arrangement has also been made whereby the Director of Veterinary Services, Madras, would investigate plant poisoning utilising his own staff and the Veterinary Investigation Officer, Madras, and in event of any plants suspected of causing poisoning in animals being detected, he would communicate with Col. Chopra of the School of Tropical Medicine, Calcutta, who is in charge of the Council's scheme for research on the systematic cultivation of medicinal plants and study of fish poisons, and obtain a report about their identity.

(*b*) *Investigation into the efficacy or otherwise of the indigenous system of treatment of cattle in India.*—It was stated in the last year's Report that the Advisory Board had recommended the appointment of a qualified Veterinary Officer for a period of six months to study this question in selected areas such as Orissa and Travancore. The Governing Body accepted the recommendation and sanctioned a sum of Rs. 4,500 for the purpose. An Officer has been appointed and work will start soon. In the meantime, the Council has collected information and all available literature on the subject for the use of this Officer.

(iv) *Johne's disease investigation Scheme Mysore State.*—The original scheme, which was due to terminate by the end of July 1938, has since been extended for a further period of two years, *i.e.*, up to the end of July 1940. The bacteriological investigation carried out during the previous year was continued. The inclusion of a large number of goats in the experimental herd was a special feature of the work during the period under review. The reliability of "Johnin" as a diagnostic agent was further investigated as also the chemical composition of Johne's bacillus and the oral mode of treatment with *ol. chaulmoogra.*

(v) *Scheme for the investigation of Tuberculosis and Johne's disease at Muktesar.*—Mention was made in the previous report regarding the decision to depute an Indian Officer to the United Kingdom for special training in Tuberculosis and Johne's disease in animals and to employ him on return as the Veterinary Bacteriologist under this scheme. In

consultation with the Federal Public Service Commission, Mr. Lakshmi Sahai, M.Sc., M.R.C.V.S., Veterinary Investigation Officer, Bihar, was selected and he sailed for England in November 1938. He will receive the training at the Royal Veterinary College, London, Cambridge and Weybridge.

(vi) *Scheme for investigation into the contagious abortion of cattle, goats and sheep at the Imperial Veterinary Research Institute, Muktesar.*— It was mentioned in the previous report that the Governing Body of the Council had decided that the research officer under this scheme should be recruited from abroad, as no qualified candidate was available in India. The research officer has since been recruited and is expected to start work soon. Thus this scheme for which there has been a long-felt need has been launched and it is hoped that the serious loss among young stock and the direct and indirect economic loss to the breeder due to contagious abortion and the danger to public health would be effectively combated.

(vii) *Helminthological Research.*—During the year under review the Council received two schemes, *viz.*, (i) one from Dr. Moghe, Head of the Department of Zoology, College of Science, Nagpur, the cost involved being Rs. 2,900 for one year, and (ii) the other from the Director, Imperial Veterinary Research Institute, Muktesar the cost involved being Rs. 34,500 spread over 5 years. Both these schemes were considered by the Helminthological Committee at their meetings held in November 1938. The recommendations of the Committee in respect of both the schemes were adopted by the Advisory Board and the schemes will be submitted in due course to the Governing Body of the Council for approval.

The review of the general position regarding Helminthological research in India and the general survey to be made in regard to the incidence of infection, was also considered and it was observed that in order to carry out the survey within a reasonable time it was necessary to provide additional staff consisting of one Research Assistant and two Labortory Assistants to each of the existing helminthological centres. This proposal involves an expenditure of Rs. 24,400 spread over a period of two years. The Advisory Board of the Council was, however, of the opinion that the question should be examined by the Directors of Veterinary Services and the matter postponed for consideration till the next meeting of the Board.

(viii) *Goat virus vaccination scheme.*—The economic and scientific importance of rinderpest, which is known to be responsible for 60 per cent. of the total annual mortality in cattle in India, has been appreciated fully in recent years. The original researches conducted at the Imperial Veterinary Research Institute, Mukteswar, by Dr. Edwards between the years 1926 and 1928, went to prove the value of the new 'goat virus alone' method. With a view to study, on a comprehensive scale, the various aspects of this new method of vaccination and to test its efficacy, a scheme relating to the employment of a field staff consisting of eleven Veterinary Assistant Surgeons was submitted by the Government of the Central Provinces and Berar. The scheme was sanctioned by the Council in 1934 but it actually came into force from March 1935. It terminated in March 1938.

The investigation has led to the following conclusions:—

(i) A fixed goat virus (blood and tissue) "Muktesar strain" is virulent for goats but possesses a low virulence for cattle of indigenous breeds.

(ii) Blood virus Muktesar strain has been found to be equally safe for local bred Bengal buffaloes in this province.

(iii) A local strain of virus has been found to be quite safe for cattle after the 40th "passage" through goats, and for buffaloes of local breed after the 80th "passage".

(iv) Tissue virus prepared from both the strains "Mukteswar" and "Local" have been given extensive trials.

(v) Both types of vaccine (blood and tissue) have proved efficacious in dealing with rinderpest outbreaks.

(vi) In imported breed of cattle, and in milking buffaloes (Murrah and Surti breed) virus-*cum*-serum method of inoculation is recommended. This obviate the risk of severe reaction as well as loss of milk yield.

(vii) The lowest period of immunity tested so far was 3½ years in the case of blood virus and it is anticipated that it would prove to be potent for longer periods.

(viii) Besides its cheapness in cost the other great advantage in the case of goat blood and tissue virus is that if extensive inoculations are carried out in an area on a prophylactic basis, the chances for spread of infection from vaccinated to non-vaccinated animals are very remote.

Apart from the large amount of valuable scientific data dealing with the various aspects of goat virus vaccination obtained under this scheme, the Central Provinces and Berar has been materially benefitted by the mass inoculation of cattle in certain areas where those cattle will remain immune to the disease at least for three to four years to come. Altogether in 3 years, as many as 382,621 animals were inoculated with different methods and the results have been extremely satisfactory throughout. Another great advantage is that goat virus vaccination has been made very popular among the local people and nomadic cattle dealers and has thereby facilitated the working of the Cattle Disease Act which is going to be enforced there very shortly.

(ix) *Scheme of research on warble flies.—Geographical Distribution.*—The report for 1937-38 discloses that the Punjab and the North West Frontier Province are the most heavily infested provinces, while the pest is fairly common in the United Provinces and has also been noticed in the hilly tracts of Bengal. Areas with little or no rainfall after the winter months, seem to be well suited for the safe completion of the parasites' life cycle.

Seasonal occurrence.—The results of short surveys in the Punjab and North-West Frontier Province revealed that at Hissar the larvae reached their final stage in the animal's back, by the end of September and no tumours were observed in the back after the middle of January. In Kohat and Peshawar, the larvae were observed to form tumours in the third week of August and kept appearing till the middle of February, while at Mukteswar the larval tumours were first noticed in the middle of November and had been encountered as late as the beginning of March. A calendar has been drawn up showing the seasonal occurrence of the pest around Mukteswar and it is proposed to draw up similar calendars for

the different localities in India. Observations have also been made regarding the habits of H. Lineatum. It was noted that the infested animals lost in condition so long as the larvae remained on the back and there was a rapid gain in weight after the disappearance of tumours.

B.—Dairying and Cattle Breeding.

Animal Husbandry Bureau.—Further progress was made during the year regarding the collection, collation and publication of information relating to animal husbandry matters.

Besides the Report of the Village Enquiry regarding cattle and the production and consumption of milk to which reference has been already made, the following publications of interest have been issued during the year:—

Milk Records of Cattle in Approved Dairy Farms in India.—Miscellaneous Bulletin No. 18. Rs. 2-12-0 per copy.

Definition of Characteristics of Seven Breeds of Cattle of All-India Importance.—Miscellaneous Bulletin No. 27. Rs. 1-10-0 per copy.

The first of these contains records of lactations completed during 1936-37 by milch stock in dairy farms in India. This is the first publication of its kind and it contains information regarding the milking capacities of a number of breeds of Indian cattle and buffaloes. This series is being continued and the compilation of the second instalment comprising records for 1937-38 has been taken in hand. The second publication has been fully described elsewhere.

A bulletin, containing photographs of Prize Winners of the First All-India Cattle Show was also issued during the year. In collaboration with the Imperial Dairy Expert, a paper relating to the production of milk fat by Hariana and Tharparkar Cattle and the influence thereon of seasonal level of production, etc., was prepared for publication in the Agriculture and Livestock in India.

A comprehensive note on the improvement of the Buffalo in India was prepared and issued as a press note.

A paper on the development of pedigree registration and milk recording was read at the 3rd Animal Husbandry Wing meeting held in February 1939.

From January to August 1938 two members of the staff were deputed to the office of the Assistant Director. Dairy Farms, Northern Circle, Lahore Cantt., for extracting data which have accumulated in the records of Military Farms. It is expected that an analysis of the data, when completed, will furnish solutions to a number of problems of interest to dairymen in the country.

As regards milk recording, a number of private and State-owned dairies were visited during the year. Forms for the recording of milk yields and pedigrees were supplied free to a number of farms. Copies of the form of Cattle History and pedigree Sheet, as approved by the Standing Dairy Committee will be supplied free to such dairies as agree to keep proper

records and supply them for publication. A satisfactory development of this work will provide an incentive to systematic recording and will also ensure uniformity and facilitate co-ordination which are essential for the proper development of cattle industry.

Steps were also taken to study the records of goat at the Etah Farm and to carry out a progeny test of the bucks in use there.

(ii) *Scheme for research into the composition of Milk at the Allahabad Agricultural Institute.*—Accurate knowledge of the composition of milk is of value in cattle breeding as it helps in the assessment of the requirements of the milch cattle. Workers in human nutrition are interested in the food value of milk available in this country not only as purchased in the bazar, but also as actually produced by the cow or buffalo. To prevent adulteration, public health legislation must be based on data on Indian milk and not on European standards. For these reasons the extreme limits of variation in normal Indian milk should be determined and considered while establishing standards for this country. The scheme under consideration has been designed accordingly to carry out a comprehensive survey of the composition of Indian milk.

The report on the working of this scheme for the period from the 1st April 1937 to the 31st March 1938 was considered by the Advisory Board at their meeting held in May 1939. During this period, analyses were made on 842 samples of milk. For this investigation sixty milch animals of varying ages and calving at different times of the year were taken to constitute a typical herd. The management and feeding have been on uniform lines resembling the common practice in the Department of Animal Husbandry of the Institute and the neighbouring villages. The experimental animals were reared on the Institute farm under normal conditions and their ages ranged from three to sixteen years; and in the case of ordinary village animals, the ages ranged from five to sixteen years. All the animals included in the experiment were within their tenth lactation.

The scheme was extended for a period of one year with effect from the 1st July 1938 with a view to cover one more lactation of cows already under investigation and also for work on herd milk and toned milk.

(iii) *Scheme for the formation of milk recording societies as an aid to developing high milk yielding strains of the more important Indian breeds of cattle.*—Considerable progress has been made in this direction. The intention underlying the scheme was that a recorder should be appointed in each of the native districts of the eight principal milch breeds of cattle and that there should be a Central Recorder attached to the Council at its Headquarters, who would periodically visit the local recording centres, check the result and collate them. The scheme is in progress in the Punjab, Bombay, the United Provinces and Madras. The Sind Government are shortly expected to participate in the scheme. While accepting the scheme, so far as it affected the Provinces, the Governing Body of the Council, who considered the matter at their meeting held in July 1938, were of the opinion that for the present a Central Recorder should not be appointed. It is anticipated that valuable data will be available as a result of this work which involves a small expenditure.

(iv) *Financial Assistance to the Allahabad Agricultural Institute for continuance of the Indian Dairy Diploma Course.*—In June 1936 the Central Government sanctioned a grant of Rs. 6,000 per annum to the Allahabad Agricultural Institute for a period of two and half years with a view to enable the Institute to train up students for the I. D. D. course. On the expiry of this period, the authorities of the Institute intimated to the Central Government that, if the grant was not renewed, it would not be possible for them to admit students to a fresh course of studies for the I. D. D. The Central Government expressed their inability, owing to financial stringency, to renew their grant.

The existing arrangement for the I. D. D. course is that the Imperial Dairy Institute, Bangalore, and the Allahabad Agricultural Institute admit students to this course in alternate years. In accordance with this arrangement, the Institute at Bangalore would not admit any new student during the year under review. The result of discontinuing the Course at the Allahabad Agricultural Institute would be that no admission to this course would take place anywhere in India during the year.

Dr. Wright had recommended in his report that advanced dairying instruction should be undertaken at the Provincial Agricultural Colleges and that such centres might be given financial assistance by the Central Government. This recommendation is under the consideration of the Government of India.

In view of the recommendations of Dr. Wright and to avoid any gap in the facilities for training in dairying, the Governing Body approved of a grant of Rs. 6,000 per annum for a period of two years from 1st July 1938 to the Allahabad Agricultural Institute for the continuance of the I. D. D. course.

C.—Animal Breeding (Sheep and Goats).

(i) *Scheme for the improvement of indigenous sheep at Hissar.*—The report on the scheme for 1937-38 shows *inter alia* that experiments were carried out on selective breeding, the effect of inbreeding on the physical development of the stock, the breeding of white faced sheep, the economic age at which a sheep should be sheared and the effect of washing of sheep on the quality and yield of fleece. It was found that though there was a marked difference in the yield of wool of a "washed" sheep and an "unwashed" sheep, the price offered by the Indian Mills for both "washed" and "unwashed" wool was about the same, and this indicates that the marketing of wool in India is so neglected that there is no encouragement for the breeders to clean their sheep by regular washing. In foreign markets, however, the washed wool is being sold at a premium. The Agricultural Marketing Adviser to the Government of India has taken up the investigation of these questions so far as the Indian markets are concerned.

A study of the effects of washing on the growth of wool is also in progress.

(ii) *Scheme for the improvement of goats in the United Provinces.*—This scheme is being worked at the Mission Poultry Farm at Etah since June 1931 and in view of the useful work that is being done, it has been

extended up to June 1941. The reports for 1937-38 and 1938-39 disclose substantial increase in the average milk yield of the herd maintained at the farm and in the milk yields of the daughters over their dams. The cost of production of milk has been progressively reduced, the cost during 1938-39 being 7·2 pies per pound. A process for the manufacture of "sweet cottage cheese" has been standardised.

There is a great demand for the Jumna Pari and Bar Bari male kids that are being reared on the farm for distribution among the neighbouring villages. Altogether 28 male kids have been supplied during the last two years and orders for 97 male kids are pending. 238 goats (209 adults and 29 kids) have been supplied to the different provinces during the last eight years and so far 481 goats from villages have bred to the farm bucks.

(iii) *Angora Goat Breeding Scheme.*—With a view to investigate the possibility of rearing Angora goats in India, especially in the North West, so that it may be possible to start a *mohair* industry, the Council approved of a proposal to depute, at its own expense for a period of six months, an experienced livestock officer to South Africa to study the problem locally. Captain W. S. Read, Superintendent, Government Cattle Farm, Hissar, was selected for the purpose and he sailed for South Africa in March 1939. His report regarding the results of his investigations and the possibility of rearing Angora Goats in India will be submitted to the Council in due course.

(iv) *Madras Sheep Breeding Scheme.*—The main breed of sheep to be experimented upon under this scheme is the Bellary breed. The object is to evolve, if possible, a better type of this breed by cross-breeding with the Bikaner rams. For this purpose it is proposed to undertake experiments so as—

(*a*) to breed a type of white wool sheep as far as possible;

(*b*) to produce a sheep which will give more and better wool and also a better carcase and one which will respond to feeding and fatten easily and be suitable for the climate of Southern India;

(*c*) to ascertain if sheep can stand two lambing periods in one year if well fed, without suffering in constitution and physique;

(*d*) to find out the best time for castration;

(*e*) to teach better methods of shearing and wool classing; and

(*f*) to investigate diseases of sheep in collaboration with the Director of Veterinary Services.

The work on the scheme started in October 1938 and it will be some time before definite results can be expected.

(v) *Bombay Sheep Breeding Scheme.*—The scheme was started in November 1937. The report for the period November to June 1938 discloses that information is being collected on the following heads:—

1. The breeding performance of individual ewes and rams.
2. The wool yields and sample cards of wool of each animal
3. The samples of monthly wool growth of typical animals.
4. Effect of the grazing of sheep on different bushes and grasses.
5. Monthly weights of all sheep together with health notes.

(vi) *Scheme of research of indigeneous goat breeding at Hissar.*—This is a part of a co-ordinated scheme for the improvement of goats in this country and may be regarded as an extension of the work already in progress at Etah on Jumna pari goats. In view of the small size of the flock at Etah and the wide area in which Jumna pari goats are in demand, it was felt that opportunity should not be lost of making use of the facilities and flock available at Hissar and of the selection work already done there for the benefit of the country as a whole.

The objects of the scheme are:—

(*a*) systematic improvement of Jumna pari goats by selective breeding, grading, culling, milk recording and progeny tests;

(*b*) to provide the nuclei for herds of Jumna pari goats for goat breeding schemes in other provinces;

(*c*) to provide young pedigree goats for issue to breeders in the Punjab and outside;

(*d*) to investigate diseases of goats;

(*e*) to improve the methods of branding, tattooing, clipping, mating and castration, and

(*f*) to investigate relationship between various rations and milk yield.

The scheme, as sanctioned by the Council, is estimated to cost Rs. 38,000 (to be divided equally between the Punjab Government and the Council) spread over a period of five years. Work on the scheme was expected to be commenced from 1st October 1938 but in view of the total failure of grazing as a result of three successive bad monsoons, it was decided to postpone work by one year.

D.—Animal Nutrition.

In his Report on the Development of the Cattle and Dairy Industries in India, Dr. N. C. Wright has emphasised the need for co-ordinated research on animal nutrition in India. Four schemes dealing with different aspects of animal nutrition are already in progress at Dacca, Coimbatore, Sabour (Bihar) and the Imperial Institute of Sugar Technology, Cawnpore. During the year under review two more schemes have been financed by the Council. A brief account of these schemes is given below:—

(i) *Animal Nutrition Research Scheme, Dacca.*—The scheme started from 23rd January 1932, and, in view of increased work, the Council made a supplementary grant for two years for one senior and one junior Assistant. The secheme was extended for another five years from the 2nd January 1937. The extension expired on 1st June 1937 and was not continued. During the year 1937-38 mineral assimilation under the condition of feeding *Aus* paddy straw along with mustard cake and *Boro* paddy straw alone was studied; the relation of mineral with reference to true weight was examined; investigation was conducted in regard to the feeding and digestion of Napier silage; and the new method of digestibility estimation was further tested.

(ii) *Animal Nutrition Research at Coimbatore.*—The report of the work done under the scheme during the year 1937-38 shows that study in mineral metabolism and mineral deficiency of blood was continued, using in the latter work a new technique of the use of Kimble venules for drawing blood samples in the field for transport. The technique was found to be

convenient and satisfactory as blood could be kept for five days in a condition fit for analysis. Pasture surveys were carried out in the Kangayam taluq of Coimbatore district, Palnad and Vinkouda taluq of the Guntur district and at the Guntur Agricultural Research Station. Work on the biological value of cereals was continued and that of rice started. The problem of poultry nutrition was also studied during the year.

(iii) *Scheme for the analysis of indigenous fodders in Bihar.*—During the year 1937-38 work was concentrated on the intensive study of important fodders like Maize, Juar, Elephant grass, Paddy straw Kheori, Meth and Berseem. A study was made of the changes in the composition of a particular fodder when grown under different soil and climatic conditions obtaining in Bihar. Investigation was also made as to how the different fodders compared with one another in regard to their organic matter and mineral contents. This information will be of value in ascertaining the superiority of one fodder over the other in respect of their constituents. Investigation was carried out in order to discover tracts in the province where fodders in general were richer in minerals protein, etc., and also tracts where the fodders were definitely poorer in these constituents. Soil samples were analysed and effects of cultivation and manuring on the changes in the composition of the fodders were studied.

The scheme started in October, 1936. As this is only the second year of the scheme the work is still in a preliminary stage and the results obtained so far are only of a tentative nature.

(iv) *Scheme for the manufacture of cattle feeds from molasses.*—The scheme was started in November 1935 at the Imperial Institute of Sugar Technology, Cawnpore. It was due to expire in November 1938 but was extended for a further period of three years. The Advisory Board of the Council, while recommending the extension, observed that the results of the feeding trials conducted under the scheme should be brought before the Standing Animal Nutrition Committee of the Council. This was done and the Committee felt that the results obtained so far needed further scrutiny and verification based on a detailed scientific investigation. It, therefore, recommended that a complementary scheme should be worked out at the Animal Nutrition Scheme, Izatnagar. The Director, Imperial Veterinary Research Institute, Mukteswar, has been requested to submit a scheme on the subject and his proposals are awaited.

(v) *Feeding of Cattle at Departmental Farms in the United Provinces.*—The scheme started in April 1938. The Research Officer in charge of the scheme, submitted a technical programme in November 1938. The statistical aspect of the programme was discussed and settled in a meeting arranged between the officer-in-charge and the Statistician to the Council. The programme as finally revised is awaiting the formal approval of the Advisory Board. Meanwhile work has already started with the approval of the Animal Husbandry Commissioner with the Government of India.

(vi) *Scheme for determining the feeding values of certain food grains, oil-seeds and oil-cakes.*—The scheme was submitted by Dr. P. E. Lander of the Agricultural College, Lyallpur, and was originally sanctioned for a period of 5 years at a total cost of Rs. 38,600. At their meeting in December 1937, the Governing Body, however, decided that the scheme should be financed for a period of 3 years at a total cost of Rs. 23,000. The programme was modified accordingly and its statistical aspects are due to be considered by a small informal Committee consisting of Dr. Lander. Dr. K. C. Sen, Dr. Ramji Narain and Rao Bahadur Vaidyanathan. Work

will start as soon as the programme is finally approved by the Advisory Board. The programme, as at present drawn, provides for a study of fifteen varieties of food grains including Gram, Maize, Barley, Oats, Wheat, Bajra, Arhar and Masur, 3 varieties of oil seeds, *viz.*, Linseed, Sarson and Soya bean and 5 varieties of oil cakes including Sarson, Linseed and ground-nut.

E.—Poultry.

Poultry Husbandry Scheme, Bombay.—The report for 1937-38 shows that the work was considerably hampered by the outbreak of 'Ranikhet' disease which was responsible for the death of 300 birds. Experiments were conducted to test the comparative values of grain feeding as is done in the villages and feeding of grain and mash with animal protein included. It was found that birds which received grain mixture laid on an average 110 eggs per bird, while those on the grain and mash feeding with animal protein laid 173 eggs on an average. There was no appreciable difference in the weight of eggs. The cost of producing eggs per dozen was annas four and pies 7·55 for the first feed and annas 5 and 0·75 for the second feed.

During the year 150 birds, hens and cocks, and 15 ducks were supplied to the districts, Indian States and places outside the Bombay Presidency.

F.—Fish.

Scheme for the investigation of life history bionomics and development of fresh water fishes in Bengal.—The report for 1937-38 on this scheme contains valuable information especially on identification and food of fries, sex determination, breeding habits, and identification of sex in fries at their early stage. The Fish Committee which considered the report was of the opinion that during the scheduled duration of three years, this scheme would only provide some preliminary data in regard to the four varieties, *viz.*, Katla, Rohu, Kalbaus, and Mrigale and that there was a long list of edible fish on which these experiments needed repetition. Further in regard to these four species the Committee desired that in addition to the work already being carried out, the following items should be further investigated:—

i. Determination of artificial and natural foods.

ii. Detailed information on fish culture on a larger scale.

iii. Work on artificial breeding.

The Committee also suggested that similar work on species of other edible fish should also be carried out which however, should form the basis for a further scheme.

CHAPTER XIX.

SUGAR RESEARCH.

(i) Standing Sugar Committee.

No meeting of the Sugar Committee was held during the year 1938-39. The eleventh meeting of the Sugar Committee took place in May 1939, and the recommendations made by it will appear in the Report for 1939-40. A list of members of the Committee, as re-constituted on 5th June 1939, for a period of 2 years, is appended (Appendix).

The following proposals for the renewal of existing schemes recommended by the Sugar Committee at its meeting held in March 1938 were sanctioned by the Council during the year under review:—

(1) Sugarcane Research Scheme in Madras.

(2) Sugarcane Research Scheme in the United Provinces.

(3) Sugarcane Research Scheme in the Punjab.

(4) Sugarcane Research Scheme in Bihar.

(5) Sugarcane Research Scheme in Assam.

(6) Sugarcane Research Scheme in Mysore.

(7) Scheme for Sugarcane Sub-Station, Karnal.

(8) Scheme for research on Genetics of Sugarcane.

(9) Scheme for the manufacture of cattle feed from molasses.

(10) Sugarcane insect pests scheme (Central portion) at the Imperial Agricultural Research Institute, New Delhi.

(11) Extension of the Scheme of work on the Insect pests of sugarcane in the provinces.

(12) Extension of the Sugar Marketing Survey conducted by the Agricultural Marketing Adviser to the Government of India.

(ii) Funds for Sugar Research.

During the year 1938-39 the Council received a special grant of Rs. 3·5 lakhs from the Government of India for financing certain approved schemes. With effect from the 1st April 1939, the Government of India have decided that funds for schemes of sugar research and cognate activities to be conducted by the Imperial Council of Agricultural Research on the advice of the Standing Sugar Committee will be provided from the Sugar Excise (one anna) Fund. Assuming that the average production of white sugar in India is 9,00,000 tons, the fund should receive each year 11·25 lakhs. A normal distribution of this amount will therefore be somewhat as follows:—

	Lakhs.
Imperial Institute of Sugar Technology, Cawnpore . . .	4·15
Imperial Council of Agricultural Research for research schemes	3·50
Distribution to Provincial Governments (for expenditure on schemes ancillary to the Imperial Council of Agricultural Research schemes)	3·60
Total .	11·25

The exact allocation each year will, of course, depend upon the amount actually realised.

During the year 1939-40 the Government of India have allotted a sum of Rs. 2,28,000 for the Imperial Council of Agricultural Research schemes and Rs. 4,30,000 for the Imperial Institute of Sugar Technology, Cawnpore.

(iii) Research on the Insect Pests of Sugarcane.

A brief account of the Sugarcane Insect Pests Scheme at the Imperial Agricultural Research Institute and in the provinces is given in the last year's annual report. On the recommendation of the Sugar Committee a small committee of entomologists working on sugarcane insects was called in May 1938—

(*a*) to make recommendations as to the location of the stations for conducting the scheme of work on the insect pests of sugarcane in the provinces, and

(*b*) to consider the results of the investigation so far made on sugarcane pests and preparation of programmes for future work both at the Centre and in the Provinces.

As a result of the recommendations of this Committee eleven more centres for work on the sugarcane insect pests have been opened in the Provinces.

(iv) Ratooning experiments.

In the last year's report it was stated that the lay-outs of the ratooning experiments in the United Provinces and Bihar were under discussion. The lay-outs have since been approved and the work started.

(v) Co-ordination in Sugarcane and Rice Manurial Experiments.

One of the most important recommendations made by Sir John Russell in his report (pages 12 and 23) on the work of the Imperial Council of Agricultural Research was regarding the need for the re-planning of manurial experiments on sugarcane and rice after the results of the first period (now concluded) had been analysed by the Council's Statistician. The Statistician accordingly analysed all the experiments of the last five years not only for stations financed or subsidised by the Imperial Council of Agricultural Research but also for all other stations where sugarcane and rice manurial work had been carried on. A statement of conclusive results reached was considered by a Joint Committee on Field and Manurial Experiments and by the Advisory Board in November 1938. As a result of their deliberations certain model experiments were framed and recommended to be conducted at different experimental stations. These model experiments have since been started at most of the stations interested in conducting trials in manuring.

(vi) Publications.

An account of the work done at several sugarcane research stations financed by the Imperial Council of Agricultural Research is being published separately in the form of a pamphlet entitled 'Summary of Some Practical Results of Sugarcane Research in India'. This will be translated into Hindi and Urdu for the purpose of giving it wide publicity.

CHAPTER XX.

IMPERIAL INSTITUTE OF SUGAR TECHNOLOGY.

(i) Industrial and Technical.

Out of a total of 154* cane factories in India, 136* factories worked during the season 1937-38 as against 137 factories in the previous year. 17 factories did not work during the season and one has been excluded as it is a small Experimental Factory for training of students with a nominal and uncertain output. 143 cane factories are expected to work during the season 1938-39 out of a total of 158 factories in India. 10 factories are expected to refine gur during the year 1938 as against 9 in 1937.

The position of the sugar industry in India on its technical side is shown by an analysis of the average percentage recovery of sugar from cane in different provinces of India during the season 1937-38 compared with that of the previous season.

Average percentage recovery of sugar from cane during the season 1937-38.

	Average percentage recovery of sugar from cane.							
	1937-38.				1936-37.			
	United Provinces.	Bihar.	All other Provinces.	All India.	United Provinces.	Bihar.	All other Provinces.	All India.
Maximum .	10,86	10,43	11,63	11,63	10,49	10,55	11,43	11,43
Minimum .	6,49	6,56	5,	5,88	8,36	8,52	6,06	6,06
Mean . .	9,18	9,58	9,77	9,38	9,65	9,20	9,60	9,50

The highest recovery for the season was 11·63 per cent. as against 11·43 per cent. during the preceding season. The average extraction for Bihar shows a substantial increase but in the United Provinces it fell considerably as the cane was diseased in several areas. The All-India average extraction also decreased from 9·50 in 1936-37 to 9·38 in 1937-38.

The work under Sugar Production Rules, 1935, continued as usual with some minor changes. Forms D (i) and E (i) of monthly manufacturing and final manufacturing reports respectively were slightly modified. The explanatory notes regarding these forms given in the revised edition of the pamphlet entitled "Sugar Production Rules, 1935, with explanatory notes" were also accordingly modified. Consolidated statements of (i) monthly manufacturing data, (ii) total price paid for cane and the net price actually received by the grower (monthly) and (iii) Sugar Production and Stocks (Fortnightly) in respect of Central Sugar Factories were compiled, cyclostyled and distributed regularly.

* Sugar factories in Burma have been excluded.

Reviews of the working of the Central Sugar Factories and Central Refineries in India for the seasons 1936-37 and 1935-36 and for the years 1935 to 1937 respectively were compiled, printed and distributed to co-operating factories, Departments of the Government of India and Provincial Governments and important Sugar Organisations.

In addition to the above work in connection with Sugar Production Rules, 1935, there was a heavy demand from Central Sugar Factories for the scrutiny and comments on their periodical manufacturing reports.

Technical survey of the gur industry all over India with special reference to gur-making outfits and improvements made thereon, which was undertaken last year, was completed during the year under report. A detailed note on the subject was prepared and sent for printing.

The Provincial Governments of the United Provinces and Bihar were advised regarding extension of plants by Central Sugar Factories who applied under the Sugarcane Control Rules framed by the respective Governments. Technical advice on each such application required critical scrutiny of the manufacturing results of a factory and the different units of the complete plant it had.

There was a heavy demand of the services of the Director, officers and other technical staff of the Institute for giving technical advice to sugar factories and Provincial Governments. The following table shows the varied nature of activities in this connection.

1. Run reports scrutinized including schemes and specifications drawn up	71
2. Technical advice regarding extension of plants	90
3. Number of visits paid by the Director and other technical staff to factories for technical advice	20
4. Number of replies to technical enquiries	786
5. Number of sugar factories helped in recruiting their technical staff	28

(ii) Research and Experiments.

During the year under report the following experimental and research work was in progress in the undermentioned Sections of the Institute:—

(A) *Division of Sugar Technology.*—

(*a*) Studies on the bleaching of cane-syrups and molasses in the double-sulphitation process with particular reference to conditions prevailing in India.

(*b*) Buffer action in syrups.

(*c*) Comparative studies on the clarification of low and high purity juices under the different systems of clarification adopted in sulphitation plant.

(*d*) The effect of dust seeding on the colour of sugars.

(*e*) Keeping quality of gurs.

(*f*) Activated carbons.

(B) *Division of Biochemistry.*—

(*a*) Rapid conversion of molasses into manure.

(*b*) Keeping quality of sugars.

(*c*) Molasses road composition.

(*d*) Manufacture of yeast.

(*e*) Manufacture of acetic acid from molasses.

(C) *Division of Physical Chemistry*—

(*a*) Dialysis of cane molasses and other cane products.

(*b*) Molasses emulsions.

(*c*) Clarification of cane juice by sodium aluminate method and carbon process.

(*d*) Clarification of cane juice using the electro-dialytical methods.

(*e*) Deterioration of Indian sugars, its cause and its prevention.

(*f*) Determination of the ash content of sugar products by the conductivity method.

(*g*) Activated carbons from bagasse and from other Indian raw materials.

(*h*) Recovery of sugar from molasses.

(*i*) Clarification of sugar syrups.

(*j*) Purification of gur to render the same fit for Toffee manufacture, sweet making, etc.

(*k*) Studies on the keeping quality of gurs.

(D) *Division of Sugar Chemistry*—

(*a*) The maturity and ripening test analysis of sugarcane varieties grown on the Kalyanpur farm.

(*b*) Clarification of final cane molasses.

(*c*) Exhaustibility of Indian factory molasses.

(*d*) The sulphur dioxide content of direct consumption sugars produced in Indian factories.

(*e*) Deliming of clarified juices with ammonium phosphate.

(*f*) Utilization of molasses—Recovery of sucrose by precipitation as sucrate of lime after the destruction of reducing sugars by boiling alkali and by determination of the solubilities of sucrose, glucose and fructose in aqueous solutions of different salts.

(*g*) Determination of moisture in gur.

(E) *Statistical Section*—

(*a*) Determination between manufacturing expenses and capacity, duration of season and recovery of sugar.

(*b*) Analysis of sugar and gur prices in India in the post protection period.

(*c*) Determination of maximum and minimum percentage of crystals above a given size for the different Indian sugar standards.

(*d*) An investigation on the correlation between the capacity and efficiency of cane sugar factories.

(F) *General Research*—

(*a*) Manufacture of activated carbons.

(*b*) Activated compost from cane trash.

(iii) Engineering.

In the Engineering division of the Institute some alteration in machinery was carried out during the year under report in the Experimental Sugar Factory for securing improved and more continuous operation. The use of well-water for make-up in boiler feed was discontinued and condensates only used. This alteration for preventing scaling of the boiler enabled the operation periods to be extended.

Two experimental cane crushing mills for use at the Bilari Research and Testing Station were designed in the Drawing section of this division and completely constructed in the Engineering Workshop of the Institute.

The work done in the Drawing Section during the year under report includes the preparation of the following drawings—

(*a*) For alterations and improvements in factories . . .	33
(*b*) For Bilari Research Station	27
(*c*) For the Institute generally	57
(*d*) For the Experimental Sugar Factory	13
(*e*) Miscellaneous	11
Total .	141

(iv) Research and Testing Station for the indigenous system of gur and sugar manufacture.

The Sugar Research and Testing Station, Bilari, was started in January 1937, to make improvements in the Open Pan Industry on Scientific Lines. The present report on the work done at the Research Station shows that even within the first two years of its existence, valuable scientific data have been collected, which should serve as the basis for introducing improvements. A number of improvements have already been effected, with very encouraging results.

The Research Station possesses adequate facilities for training men for this industry on scientific lines. The Industries and Co-operative Departments of the United Provinces have availed of these facilities in connection with their scheme for the development of Gur Industry a number of men trained at the Research Station having been employed under the scheme. With the co-operation of the Agricultural Departments of the various Provinces in India, the spread of this scientific knowledge through their Assistants and others trained at the Research Station, should increase.

During the year under report testing and research work continued as usual. Particulars of work done are given below.

(*a*) The following machinery was tested.—

(A) *Bullock-driven crushers*—

(1) Bilari Kolhu No. 1.

(2) Bilari Kohlu No. 2.

(3) Delhi Iron Syndicate, Kohlu.

(B) *Power driven crushers*—

(1) Sharat Crusher—By Kirloskar Bros.

(2) I. C. A. R. Crusher No. 3.

(3) I. C. A. R. Crusher No. 2 (Kirloskar make).

(4) I. C. A. R. Crusher No. 4.

(C) Continuous Juice Strainer and Pump.

(D) Belt and Electric driven Juice Pump.

(E) *Bels*—

(1) Improved Rohilkhand bel—with arrangement of preheating the air for the combustion of wet bagasse.

(2) Improved Poona bel—with tilting arrangement.

(3) Multiple pan furnaces with gratings for the manufacture of Gur.

(4) Continuous flat bel with modifications.

(5) Bilari bel No. 1.

(6) Bilari bel No. 2.

(7) Two pan gur-boiling bel (designed at the Research Station, Bilari).

(8) Gaya bel—with gutter pan.

(F) *Centrifugals*—

(1) Centrifugals (Berry, Kirloskar and Jessop at different speeds and different types of screen).

(2) Foot-power centrifugal machine.

(G) Continuous sand filter.

(H) A new carbon ignition furnace.

(I) Rabometers.

(*b*) The following research work was also undertaken at the station—

(1) Work on the manufacture of activated vegetable carbon from paddy husk.

(2) Manufacture of candy from low grade Khandsari sugar on a commercial scale.

(3) Keeping quality of gur.

(4) Treatment of ordinary gur for making it suitable for preparation of sweet-meats.

(5) Clarification of cane juices by the use of extract from Dhak (*Butea frondosa*) flowers.

(6) Preparation of white jaggery.

(7) Preparation of sweets (lozenges, toffee and other confectioneries).

(*c*) *Demonstration.*—On the request of the Agricultural Department of the Government of the United Provinces, a complete sugar producing plant, designed and tested at the Research Station was exhibited and demonstrated at the Municipal Industrial Exhibition held at Moradabad in March and April 1939.

(v) Bureau of Sugar Standards.

During the year under report the 4th annual meeting of the Advisory Committee of the Bureau of Sugar Standards was convened in June 1938. *The Review of the Quality of Sugar manufactured by Central Sugar Factories and Refineries during the season 1937-38*, after adoption by the above Committee was published in the Indian Trade Journal of the 22nd September 1938 and reprints of this were supplied to all concerned.

The Indian sugar standard grades for the season 1938-39 were prepared according to the previous years' specification except for a minor change in the specification for grain standards. The revised pamphlet entitled "*The Indian Sugar Standards*" was accordingly corrected and copies of these sent to sugar factories, merchants and important Sugar Associations. The decision of the Advisory Committee in respect of allowing a certain discount on the prices of sets if the sale of sets during 1938-39 exceeded a certain number was notified. The total number of sets issued during the year was 95 as against 72 issued during the previous year. In addition to the above sets, 28 standard grade bottles and 1,329 empty bottles were also sold as against 5 standard bottles and 87 empty bottles sold last year.

As in previous years, letters were sent from time to time to all concerned for explaining the necessity for and the use of the standards.

Sieve analyses of a large number of samples of sugar were done with a view to fix percentage weights of grains corresponding to the different prescribed standard sizes. Work is also in progress on the use of Tintometric values of sugar solutions for grading of sugars.

For eliciting opinion of the industry and the trade on the application of the Agricultural Produce (Marking and Grading) Act to sugar on the basis of the Indian sugar standards, letters, explaining the implication of the above Act were issued and relevant extracts from the replies received were communicated to the Agricultural Marketing Adviser to the Government of India for information.

Samples of sugar were obtained for the museum of the Imperial Institute of Sugar Technology from sugar factories in India and reports on the quality of each sample received were supplied to the factories concerned.

Samples of gur, rab and other sugar products were also obtained from the different agricultural farms and important markets in India and exhibited in the museum.

Arrangements are now in progress for the preparation of the Indian standard grades for the next season, for compiling the *Review of Quality of Sugar made in India during 1938-39*, and for convening the fifth annual meeting of the Advisory Committee for considering the progress made and the future work to be done by the Bureau of Sugar Standards.

(vi) Cattle Feed Experiments.

An extension of the scheme for the manufacture of cattle feed from molasses for a period of three years from 1st April 1938 was sanctioned by the Imperial Council of Agricultural Research.

About 1,500 maunds of the balanced feeds containing bagasse screenings, different oil cakes and molasses in the proportion of 2:3:4 were made and despatched to the different animal nutrition centres during 1936-37 and 1937-38 for conducting feeding trials. The reports received of the trials have indicated that the feed was taken and relished by cattles though it was found slightly less nutritive than other more expensive feeds. There has been no adverse effect in the yield of milk. In some cases the feed was taken by cattle only when mixed with other foods and at one centre the animals had attacks of diarrhoea. These ill-effects, however, passed off after some time and all the animals relished the food.

The Sugar Committee of the Imperial Council of Agricultural Research at its tenth meeting held in the month of March 1938 recommended the making of feed with bagasse screenings and molasses alone, with a view to study what common fodders this could economically replace. Such modified feed was accordingly prepared and distributed to the animal nutrition centres during the year under report.

Interim reports received from the Imperial Dairy Department, Bangalore, on the feeding trials show that 3 lbs. of this feed replace 3 lbs. of Ragi Straw or 1 lb. of Standard Concentrate containing 4 parts of wheat bran, 2 parts of groundnut cake, 2 parts of gram husk, 1 part of gram Chunni and 1 part of gingely cake, and that the feed was relished by the animals. Steady increase in the weight of the heifers was maintained and no detrimental effect was noticed on the live-weight and the milk yield in the case of cows. The health of the animals was satisfactory throughout. Feeding experiments at Government Dairy Farm, Patna, and at Allahabad Agriculture Institute, Naini, have been reported to be progressing satisfactorily, the cattle taking to the feed readily.

Following the information received from two centres of spontaneous combustion of the modified feed during the monsoon period, experiments have been taken up in collaboration with the Biochemist of the Institute to study the organisms responsible for this combustion and the effect of suitable anti-septics on the keeping quality of feeds.

The design of suitable equipment for making the feed on a large scale will have to be taken up when the most satisfactory feeds have been evolved as the type and design of equipments employed will depend upon the proportion and the nature of materials to be mixed. A simple furnace for heating molasses, a mixer and a suitable press are being designed.

(vii) Statistical.

The work primarily consisted in collecting statistical information on all aspects of the sugar industry in India and abroad and in preparing short notes, reviews and consolidated statements for the use of persons interested in the sugar industry in general. Fortnightly, monthly and periodical information continued to be collected from Central Sugar Factories in India and the information thus collected was scrutinized and utilized in preparing notes and consolidated statements which were issued by this office and were published in the Indian Trade Journal. The scope of statistical work had been enlarged during the year under report as arrangements were made for the collection of excise returns from the Excise Commissioner, Northern India and monthly consolidated statement of sugar production and stocks was compiled on the basis of this information and published in the Indian Trade Journal. Review of the Sugar Industry which is published annually contains very comprehensive information about the Industry.

With a view to secure quicker and wider publicity, abbreviated summaries in English, Hindi and Urdu of the various consolidated statements, memoranda and review were released for publication in newspapers all over India through the Director of Public Information to the Government of India, simultaneously with the issue of main publications in the Indian Trade Journal.

Besides publications in the Indian Trade Journal, papers, copies of the various publications as well as detailed statistical information on the sugar industry in India and abroad were readily supplied to the Government of India, Provincial Governments, High Commissioner for India, London, and persons interested in the Sugar Industry. Brief reviews of the cane crop conditions in different parts of the world were also compiled for incorporation in the All-India Sugar Cane Forecasts published by the Director General, Commercial Intelligence and Statistics, Calcutta.

The Sugar Cable Service and the Sugar Postal Service continued to obtain and distribute to its members early and reliable crop and market reports regarding sugar in the principal sugar producing countries of the world. The Indian Sugar Trade Information Service continued to collect and distribute among its subscribers daily quotations and weekly reports for sugar from important Indian Sugar Markets. A detailed scheme regarding the re-organisation of the above service to mostly suit the present conditions of sugar trade in India was prepared during the year under report and is at present under examination.

(viii) Training in Sugar Technology.

In the year 1938-39, 38 students, as per details given below, completed their courses.

(*a*) Fellowship in Sugar Technology	3
(*b*) Sugar Diploma Course	20
(*c*) Sugar Analyst Course	9
(*d*) Pan Boiling (short term course)	5
(*e*) Dutch Language (short term course)	1
Total	38

The number of students admitted to the different courses was as follows:—

(*a*) Fellowship course in Sugar Technology	4
(*b*) Associateship course in Sugar Technology	8
(*c*) Sugar Boilers' Certificate course	3
(*d*) Chemical Control (short term course)	1
(*e*) Pan Boiling (short term course)	
(*f*) Bacteriology (short term course)	
Total	19

Out of the total admission in 1938-39, four students were admitted each from the United Provinces and Madras, three each from the Punjab and Bihar, two from the Indian States and one each from Bombay, Bengal and Central Provinces.

(ix) Employment Bureau.

The work of the Bureau continued to be satisfactory and a number of technically qualified persons who got themselves enrolled in Bureau secured employment in Sugar Factories.

(x) Publications and Library.

83 notes and consolidated statements giving detailed statistical information were published in the Indian Trade Journal. The Institute Library was freely used by persons interested in Sugar Industry. 164 publications were added to the Library during the year under report.

CHAPTER XXI.

AGRICULTURAL MARKETING.

The fourth annual report of the Agricultural Marketing Adviser to the Government of India (published elsewhere) includes the summarised reports of the marketing staffs in provinces and States and shows the progress of the scheme in detail. It may be recalled, however, that the Office of the Agricultural Marketing Adviser with a Central Marketing Staff was established by the Government of India in 1935 as a result of the Report of the Royal Commission on Agriculture (1928) presided over by Lord Linlithgow, now His Excellency the Viceroy. The report embodied many recommendations for the improvement of agricultural marketing and it will be useful at this stage to take stock and see how far the main proposals of the Commission have been carried out.

(i) Marketing Officers.

The Commission recommended the appointment of a wholetime marketing officer of the status of Deputy Director of Agriculture in each of the major provinces. This has been done and three Assistants provided by the help of a grant from the Central Government through the Imperial Council of Agricultural Research. Provincial governments have, in some cases, added to their staff to meet the growing demand for development work of a practical nature. Special marketing staffs have been appointed for jute, sugar, lac and coffee. Ten leading Indian States, at their own expense, have engaged full time marketing officers. There are, therefore, now altogether 100 full time marketing officers in India and in addition over 200 minor Indian States have nominated persons to carry out marketing enquiries so that marketing work is receiving attention practically throughout the whole length and breadth of India. The marketing staff in Burma also co-operates.

(ii) Surveys.

The Commission's report pointed out the need for the collection and study of exact information in the form of marketing surveys as an essential preliminary to the formulation of an effective policy for the improvement of marketing.

By the end of March 1939 four all-India marketing survey reports had been published (Wheat, Linseed, Tobacco and Eggs). Abbreviated editions in Indian languages were issued for wheat. Those for linseed were in press and also the report on grapes. Survey work was completed and reports were being compiled in respect of seven commodities (rice, groundnuts, coffee, potatoes, milk, cattle and hides and skins) as well as on co-operative marketing. Twentyone other commodities were under survey and altogether well over 300 commodity survey reports were received in the course of the year from the marketing officers in provinces and States, for being examined and compiled into all-India survey reports by the Central Marketing Staff.

(iii) Grading and Standardisation.

In the view of the Commission there was considerable room for improvement in the quality of much Indian produce as marketed. In discussing steps which might be taken to improve the general level of quality and assist the cultivator in obtaining the full premium for quality, the Commission thought that organised trade associations in India could give great assistance in applying effective pressure to secure improved quality from the producer.

This view was fully borne out by the preliminary marketing surveys and two general lines of action were decided upon. First, the physical grading and packing of commodities such as fruit, eggs, etc., on the basis of statutory standards and second, the standardisation of contract terms for staples such as cereals and oilseeds.

The former involves legislation and the Agricultural Produce (Grading and Marking) Act was passed in 1937 for defining standards of quality and methods of marking in respect of prescribed grade designations applied to scheduled products. As a result of consultation with provincial governments and with representative trade and manufacturing interests the original products in the schedule were later added to and by March 1939 included: fruit, vegetables, eggs, dairy produce, tobacco, coffee, hides and skins, fruit products, ata, oilseeds, vegetable oils (including hydrogenated oils and vegetable fats), cotton and rice. Rules in respect of most of these commodities had been duly prepared and notified.

Further, experimental grading stations were opened or established by packers authorised in accordance with the rules under the Act. Altogether produce valued at about Rupees half a crore was graded and packed at 134 centres and sold under the "AGMARK"—the emblem used to distinguish the standard products. The number of grading stations is rapidly increasing. Up to the end of March 1939 the following had been opened; eggs (36), hides (10), ata (2), tobacco (3), fruits (27), ghee (53), and rice (3). The results of these grading stations show that there is, in fact, in India a good demand amongst consumers for reliable high grade produce for which producers can secure a substantial premium. In some cases the AGMARK products sold for 50 per cent. more than similar produce ungraded and the average increase ranged from 5 per cent. in the case of eggs to 9 per cent. for fruit and 12 per cent. in the case of ghee.

Consultations and conferences were held with associations of traders and manufacturers with a view to drawing up standard contracts for staples. The terms were designed not only to act as a basis for "futures" trading and improving the system of price quotation generally, but also to provide a premium to producers of good quality through a mutual or reciprocal scale for produce higher or lower than the basis, and at the same time to discourage the putting of dirty produce on the market by reducing the amount of refraction (impurities) allowed in the basis prescribed in the standard contracts.

Considerable progress was made towards the general adoption, throughout the whole trade, of the standard contracts for wheat, linseed and groundnuts both for crushing and edible purposes. Certain interests, however, remained opposed to the standard contracts in Calcutta, for linseed, and in Bombay and Karachi for wheat. At meetings of all the interests concerned held in Calcutta and Bombay during March, the respective Hon'ble Ministers for Agriculture indicated that if voluntary

agreement could not be secured they would consider the possibility of applying statutory sanction. In Karachi, however, it was found possible to secure unanimity among all the interests for the adoption of the standard contracts.

There is a need for the formation of more strong representative trade associations in India and as a result of negotiations and discussions initiated by the Central Marketing Staff, the Tanners' Federation of India and an Indian Tobacco Association have been formed. Committees have been set up with a view to constituting a federation of the ghee trade, and an all-India Federation of grain and oilseed trade associations and allied interests. The necessity for the last named has been particularly felt for carrying out negotiations with the corresponding trade associations in the United Kingdom, regarding standard contract terms for produce exported from India.

(iv) Regulated Markets.

Well regulated markets for all produce were regarded by the Commission as essential and it was recommended that in all provinces local governments should take the initiative in establishing regulated markets under provincial legislation. This point was again emphasised at a Marketing Conference of Ministers from provinces and States held in Delhi in November 1938.

The Central Marketing Staff circulated a model Bill and before the end of March 1939 an Act for the regulation of markets had been passed in the Punjab. Bills suitable for local conditions had been introduced or prepared in the United Provinces, Bihar and Bengal and were under preparation in Sind, North-West Frontier Province, Mysore and Travancore. The Bombay Act was being amended to include produce other than cotton, and in Madras the Commercial Crops Markets Act was extended to tobacco in Guntur district and groundnuts in South Arcot.

Statutory regulation of markets already prevailed in Central Provinces and in certain States such as Hyderabad, Gwalior and Patiala so that as soon as the recent legislation, either passed or contemplated, is put into effect this recommendation of the Commission will be well on the way to fulfilment throughout most of India.

(v) Standardisation of Weights.

An important recommendation of the Commission was to the effect that the Government of India should again undertake an investigation into the possibility of standardising weights and measures throughout India.

The investigations carried out in the course of the marketing surveys showed that conditions were chaotic and that producers suffered considerably through the manipulation of weights, measures and scales, and the fact that the comparison of prices was almost impossible owing to the trade practice of buying on the basis of a heavy weight and selling on a light.

Fortunately the surveys also showed a common thread of agreement throughout India in respect of the three cardinal weights, tola, seer and maund and as a result the Central Government passed the Standards of Weight Act, 1939. Pending the passing of Central legislation proposals were awaiting consideration in most of the provinces. Bills to standardise their weights on the basis of the all-India standards were taken in hand in

Hyderabad, Patiala and Travancore; and Mysore had indicated a readiness to follow suit. It is, therefore, reasonable to suppose that uniform standards of weight will be established throughout most of India in the very near future.

In regard to measures the marketing surveys, so far as they have gone, have not shown any common feature prevailing throughout India, regarding dry measures and it would, at present, appear that their standardisation can only be done on a local basis. So far as liquid measures are concerned the Imperial gallon is in very widespread use and the marketing survey reports have recommended that local governments should base their standard measures on it.

(vi) Market News Service.

The Commission recommended that attention should be paid to the form and manner in which market information, regarding prices and stocks at the principal marketing centres of the tract, and at the ports and the wholesale and "futures" prices ruling in major markets should be made available.

Provincial and State marketing staffs have directed their attention to initiating local market news services through the radio and by the issue of bulletins and in other ways, but it will be readily understood that having regard to the amount of other work in hand and the absence of standard weights, most of the efforts so far have been of a tentative and experimental character.

The Central Marketing Staff have arranged the daily broadcast from Delhi of "ready" and "futures" prices in Hapur market for a number of cereals, pulses and oilseeds. The price of jute bags is included in this broadcast twice a week. In addition a weekly market report in English and Hindustani is broadcast every Saturday and issued, at the same time, to over 100 newspapers. This includes information regarding the "ready" and "futures" prices and stocks of wheat and linseed at the large ports and certain important upcountry centres, as well as information regarding rice and a summary of the position in markets abroad as received from the Indian Trade Commissioner in London.

Since the surveys showed almost a complete absence of market news regarding cattle a service was opened for the exchange of prices, loadings, etc., between certain producing areas and Bombay and Calcutta. The experience so far gained seems to indicate that it is necessary to have two different types of market news services, one for markets and another for producers, but that it is not possible to lay down any general rules on this subject. Each commodity and each area presents special problems which require study and attention by the local marketing staffs. This is being done and the work is developing.

(vii) Transport, Cold Storage and Containers.

In recommending the periodical revision and adjustment of railway freights the Commission suggested that agricultural departments should interpret to the railway authorities the requirements of producers, and marketing officers should be members of the local railway advisory committees. Only in the case of the Punjab and Madras has the latter recommendation been adopted.

So far as the reduction of freights is concerned, various railways as a result of discussions with the local marketing staffs have so far allowed more than 100 concessional rates on about 30 different commodities. Attempts are being made to maintain closer relations between marketing staffs and the commercial branches of the railways.

The Commission also recommended that the possibilities of cold storage should be investigated under the auspices of the Railway Board and that experiments should be made to devise suitable standard forms of containers.

The Railway Board in collaboration with the Imperial Council of Agricultural Research and the Defence Department constructed an experimental railway refrigerated van and the Agricultural Marketing Adviser carried out test runs of the van with fruits and vegetables. The prices obtained for the produce showed considerable possibilities to be inherent in this form of transport.

Trials of improved containers were carried out for oranges in the Central Provinces and although only done in a small way showed that the produce packed in this way could command a higher price. More success has attended the experiments in devising a small standard container for eggs. This has proved of value in reducing the breakages in transport and the North Western Railway introduced concessional rates on eggs packed in this way and also a special freight on the returned empties.

The work is to some extent still in the experimental stage but the results obtained so far are promising.

(viii) Co-operative Marketing.

Co-operative sale societies should be encouraged in all possible ways according to the Commission and help can best be given in the form of assistance in the grading of produce.

Several of the grading stations for eggs and fruits already referred to were operated on a co-operative basis and secured direct price benefits for the producers. Existing producers' co-operative sale societies for ghee in the United Provinces were brought into direct contact with refiners of AGMARK ghee and not only obtained an extra Rs. 1/8 per maund above the bazar price but affected a further saving in market charges and middlemen's profits.

The marketing surveys have shown that in the case of perishables particularly a more rapid collection of village produce and a speeding up of distribution generally is required. The measured loss in the hot weather due to staling of eggs runs as high as 28 per cent. and damage to fruits in some cases even higher. The more rapid assembly of village produce by instituting co-operative societies of small village collectors was, therefore, indicated. The Frontier Co-operative Egg Sale Society of local village collectors, started by the Central Marketing Staff, has amply justified its existence not only by securing more profit for the collectors, but by bringing about a higher general level of prices for producers with a premium on large as compared with small eggs. This has been obtained entirely by the elimination of losses and more efficient distribution and not at the expense of the consumer.

There is a need for further and more rapid expansion of co-operative activites on these lines. For example, in the case of eggs alone there are at least 150 centres in India where more than 50,000 eggs are assembled daily by village collectors.

Hitherto provincial co-operative departments have confined their operations strictly to the formation of producers' co-operative sale societies —frequently with disastrous results. Where producers' co-operative sale societies are formed there is a great need for them to be linked into central co-operative unions which will operate on business lines in much the same way as a *pakka arhatiya* with the help and guidance of the local marketing staff. The co-ordination of effort, however, between local co-operative departments and local marketing staffs has been found difficult except in provinces such as the Punjab and Madras where Marketing Advisory Boards or Rural Development Boards exist on which non-officials and all departments (including Industries) concerned with agricultural marketing are represented.

The Ministers' Marketing Conference opened by H. E. the Viceroy in November 1938 took note of this fact and subsequently similar bodies had been or were in process of being established in several other provinces and States by the end of March.

(ix) Miscellaneous.

There were many incidental recommendations of the Commission. For example, that the foreign demand for specially chosen fruits should be tested. Nine tons of mangoes bearing the AGMARK were despatched to London where they met with a mixed reception but enabled useful permanent contacts to be made.

Many major recommendations of the Commission bearing on the marketing of agricultural produce are not dealt with here. For example, their suggestions for the improvement of agricultural statistics and forecasts and for the revision of normal and standard yields of various crops. These recommendations have been fully borne out by the marketing surveys. Further, the Report dealt with the development of cultivation —particularly of fruits and vegetables—and matters relating to rural welfare, communications, education and agricultural research all of which make it a useful handbook of reference for marketing officers. These important items apart, it would appear that in spite of the hiatus which occurred between 1928-1935 the main recommendations of the Commission specifically relating to agricultural marketing are fairly well on the way to being implemented.

(x) Later developments.

With the information then at its disposal the Royal Commission on Agriculture could not be expected to make positive recommendations on many important points which have since arisen.

In regard to the control of exports, for example, they could not have foreseen that the export of cigarette leaf—a trade only then in its infancy —would be disastrously affected by the absence of such control, and that by the end of 1938 practically all the interests concerned were agreed on the need for all shipments being graded and marked in accordance with the prescribed standards.

Conditions were then so rudimentary that problems connected with the wider organisation of marketing were not of immediate concern. The partial rationalisation of the sugar industry in the United Provinces and Bihar and the recently introduced Lac Control Bill in Bihar have opened up new avenues of approach to the organised marketing of other commodities.

The regulation of production has not so far been attempted except in a tentative way by the voluntary restriction of jute acreage in Bengal. The possibility of Central legislation for controlling commodity exchanges dealing in "futures"—with a view to the elimination of (Satta) gambling transactions—was only taken up by the Central Marketing Staff at the instance of the Ministers' Marketing Conference.

For future development reliance must be placed on the marketing surveys which are regularly bringing to light these and many other similar problems which can only be solved by the wit and willingness of the marketing staffs so far as governments and other interests concerned are prepared to make use of their services.

CHAPTER XXII.

PUBLICATIONS.

(i) *Journals*:—The three journals published by the Council, *viz. Agriculture and Livestock in India* (bimonthly), *the Indian Journal of Agricultural Science* (bimonthly) and *the Indian Journal of Veterinary Science and Animal Husbandry* (quarterly), entered their ninth year of life during the year under report.

The number of original articles published in *Agriculture and Livestock in India* was 58, of which 17 related to crops and soils, 21 to animal husbandry and the rest to subjects of general agricultural interest. In addition, the journal contained 108 abstracts, 51 notes and 18 reviews. In the series of illustrated articles on Sons of the Soil Studies of the Indian Cultivator which was commenced in May 1937, the following four new articles appeared during the year:—

1. United Provinces Cultivator,
2. Bihar Cultivator,
3. The Sind Cultivator,
4. The Central Provinces Cultivator.

It is now proposed to combine these series and issue them in the form of a book. The following five articles were issued during the year in the series of special popular articles for practical farmers—

1. Insects in relation to disease of domesticated animals.
2. Tick fever in domesticated animals in India.
3. The problem of animal nutrition in India.
4. Zoology in relation to veterinary science.
5. Drain of India's agricultural wealth or the problem of soil erosion in India.

The following editorials appeared in the bimonthly journal of *Agriculture and Livestock in India*:—

1. The All-India cattle show.
2. International scientific Congresses and Conferences.
3. Modern trends in veterinary education.
4. The settlement of educated men on the land.
5. Animal Husbandry at the 18th meeting of the Advisory Board of the Imperial Council of Agricultural Research, November 1938.
6. Agricultural planning and the improvement of national nutrition.

Reference was made in the last year's report to the recommendation of the Council's Editorial Committee to convert this journal into a popular monthly. The sanction of the Governing Body has been obtained for the entertainment of the necessary staff and it is hoped to issue it in the desired form shortly.

Of the 53 original articles published in the *Indian Journal of Agricultural Science*, 25 may be classed as botanical, 12 as chemical, eight as entomological, five on plant diseases, two on agricultural meteorology and one on horticulture. In addition, there were 4 research notes and 3 book-reviews.

In the *Indian Journal of Veterinary Science and Animal Husbandry* 42 original contributions were published, of which 38 related to animal diseases, three to animal nutrition and one to dairying. The arrangement for publishing in this journal abstracts of articles selected from foreign literature which would be of interest to Indian workers was continued and 20 such abstracts were published during the year.

(ii) *Preparation of critical Monographs on Indian research work*:—Preparation of critical monographs on the lines recommended by Sir John Russell has been taken up by the Council and a scheme for the writing up of a critical monograph on Dry Farming Research work in India is under consideration.

(iii) *Monographs and Bulletins*, published during the year, are as follows:—

(a) *Scientific Monograph No. 12*:—The Fungi of India, Supplement I, by B. B. Mundkur.

(b) *Miscellaneous Bulletins*.—No. 21. Investigations on the cold storage of Mangoes, by G. S. Cheema, D. V. Karmarkar and B. M. Joshi.

No. 22. Report on the village enquiry, regarding cattle and the Production and Consumption of Milk in seven breeding tracts of India.

No. 23. The Cold Storage of Fruits and Vegetables, by G. S. Cheema and D. V. Karmarkar.

No. 24. A brief survey of some of the Important Breeds of Cattle in India, Part II. Prize Winners at the First All-India Cattle Show.

No. 25. The Nutritive Values of Indian Cattle Foods and the Feeding of Animals, by K. C. Sen.

No. 26. The Progress of Agricultural Science in India during the past 25 years, by W. Burns.

No. 27. Definition of characteristics of seven breeds of cattle of All-India importance.

No. 28. Bibliography of Soil Erosion, by R. M. Gorrie.

No. 29. Report on the Prospects of Cinchona cultivation in India, by A. Wilson and T. J. Mirchandani.

(c) Agriculture and Animal Husbandry in India, 1936-37 (previously called 'Review of Agricultural Operations in India').

(d) *Marketing Series (Agricultural Marketing in India)*.

A. M. A. 4. Report on the Marketing of wheat in India (Abridged Edition).

A. M. A. 5. Report on the Marketing of wheat in India (Abridged Edition)—Hindi Version.

A. M. A. 6. Report on the Marketing of wheat in India (Abridged Edition)—Urdu Version.

A. M. A. 7. Annual Report of the Agricultural Marketing Adviser and summarized Reports of the Senior Marketing Officers in Provinces and certain states for the year ending 31st December 1937.

A. M. A. 8. Report on the Marketing of Linseed in India.

A. M. A. 9. Report on the Marketing of Eggs in India and Burma.

(e) *Miscellaneous.*—ICAR. 19 I: Report on the Cost of Production of Crops in the Principal Sugarcane and Cotton Tracts in India, Volume I—The Punjab.

ICAR. 19 II: Report on the Cost of Production of Crops in the Principal Sugarcane and Cotton Tracts in India, Volume II, Bombay.

ICAR. 19 III: Report on the Cost of Production of Crops in the Principal Sugarcane and Cotton Tracts in India, Volume III, United Provinces.

ICAR. 19 IV: Report on the Cost of Production of Crops in the Principal Sugarcane and Cotton Tracts in India Volume IV, Madras.

ICAR. 19 V: Report on the Cost of Production of Crops in the Principal Sugarcane and Cotton Tracts in India, Volume V, Bihar.

ICAR. 19 VI: Report on the cost of Production of Crops in Principal Sugarcane and Cotton Tracts in India, Volume VI, Bengal.

The following publications were in the press at the end of the year:—

(a) *Scientific Monograph*: No. 13. Further observations on Anatomical Deviations in Ox and Note on certain Anatomical Freaks, by H. N. Chelva Ayyengar.

(b) *Miscellaneous Bulletins*:—No. 6. Bee-keeping, by C. C. Ghosh (4th Edition).

No. 30. Biological Notes on Indian Chalcidoidea, by Hem Singh Pruthi and M. S. Mani.

No. 31. Studies in the Preservation of Fruit and Vegetables: An investigation on the Methods of Preparation and standardization of Tomato Ketchup, by Lal Singh and Girdhari Lal.

No. 32. Studies in the Preservation of Fruit Juices, 1. Some observations on the preparation and preservation of Citrus Fruit Squashes, by Lal Singh and Girdhari Lal.

(c) Catalogue of Indian Insects No. 24—Evanidae, by M. S. Mani.

A complete list of the publications of the Imperial Council of Agricultural Research is given in Appendix VII.

(iv) Supply of publications.—The following table shows the circulation figures for the Council's publications during the year under report:—

Name of periodical.	Supplied as exchanges.*	Sales.	Distributed, free.
Agricultural and Livestock in India	425	238	209
Indian Journal of Agricultural Science	344	137	87
Indian Journal of Veterinary Science and Animal Husbandry.	262	121	99
Scientific monographs	190	7	42
Miscellaneous Bulletins	183	32	51

There were about 650 institutions in India and 509 abroad which received one or other of the Council's publications either free or on exchange basis. The mailing list is analysed as follows:—

1. No. of exchange institutions in India*			396
2. No. of exchage institutions abroad*			406
(*a*) British Empire			
Great Britain	73		
Canada	10		
Australia	20		
New Zealand	4		
Ceylon	7		
South Africa	18		
(*b*) Africa	13		
(*c*) Russia	14		
(*d*) Europe	72		
(*e*) China	4		
(*f*) Japan	14		
(*g*) U. S. A.	81		
(*h*) Other countries	76		
3. No. of institutions, etc., in India receiving free copies			117
4. No. of institutions, etc., abroad receiving free copies			103
5. No. of newspapers and periodicals in India receiving free copies			137

(v) *Editorial Committee and Referees.*—The Editorial Committee consisted, as usual, of:—

(a) four *ex-officio* members, *viz.*, the Vice-Chairman, the two expert advisers and the Secretary to the Council, and

(b) four scientific workers in the different branches of science connected with the agriculture and animal husbandry.

* Including those supplied as exchanges by the Directors, Imperial Agricultural Research Institute, New Delhi, and the Imperial Veterinary Research Institute, Mukteswar-Kumaun.

The following changes were made in the personnel during the year:—

(i) Mr. F. Ware, C.I.E., F.R.C.V.S., I.V.S., F.N.I., Director, Imperial Veterinary Research Institute, Mukteswar, who was one of the four scientific workers on the Editorial Committee, became an *ex-officio* member of the Committee by virtue of his appointment as the Animal Husbandry Commissioner with the Government of India with effect from the 26th May 1938, and Mr. J. R. Haddow, B.Sc., M.R.C.V.S., D.V.S.M. Officiating Director, Imperial Veterinary Research Institute, Mukteswar, was appointed in his place as a member of the Committee.

(ii) Professor F. R. Bharucha, D.Sc., Professor of Botany, Royal Institute of Science, Bombay, continued to be the University member on the Council's Editorial Committee upto 30th November 1938, when his period expired. Dr. J. C. Ghosh, D.Sc., Professor of Chemistry, Dacca University, was appointed in his place with effect from the 1st December 1938, for a period upto 31st December 1939.

(iii) Dr. Burch H. Schneider, Ph.D., Professor of Animal Husbandry and Dairying, Allahabad Agricultural Institute, Allahabad, who was appointed as a non-official representative on the Editorial Committee for 2 years from July 1937, left on leave *ex-India* and in his place Mr. James N. Warner, Officiating Professor of Animal Husbandry at the Allahabad Agricultural Institute, Allahabad, was appointed for a period upto 31st December 1939 with effect from the 1st December 1938.

As in previous years, the Editorial Committee was greatly assisted by a large number of honorary specialist referees in the examination of papers received for publication. The number of such referees during the year was 79 and the Council takes this opportunity of acknowledging the valuable services rendered by them.

CHAPTER XXIII.

LIBRARY.

The Council's Library, which started with a small number of publications in 1930 has grown into a specialised collection of about 19,000 books and over 12,000 pamphlets. No less than 384 journals and periodicals exclusive of serials and annuals, are regularly received and the whole stock is increasing at the rate of about 3,000 a year. Of the 384 periodicals 115 are purchased from the research funds of the Council and the rest are received on exchange and gratis. The number of books and publications added during the year under review is 3,391 as against 3,204 for the last year. The new additions comprise 249 purchased, 3,104 received in exchange and 38 gratis. The number of exchange publications has increased to 3,104 as against 2,775 during the last year. The details of exchanges are given in appendix VIII. The following figures would throw some light on the steady development of the Library during its nine years' existence:—

Year.	Accession.			Circulation.	
	Books.	Pamphlets.	Periodicals.	Books.	Periodicals.
1930 . .	1,500	1,000	100	552	..
1931 . .	4,000	2,000	140	613	..
1932 . .	6,541	3,500	160	724	..
1933 . .	9,427	5,000	179	992	..
1934 . .	11,259	6,000	226	1,234	2,842
1935 . .	13,145	8,500	270	1,391	3,000
1936 . .	14,708	10,000	286	1,821	3,054
1937 . .	16,150	11,000	307	2,069	5,675
1938 . .	18,730	12,000	380	2,342	8,747

The total number of books and publications in the Library on the 31st March 1939 was as per details given below:—

Books and bound volumes of Journals	18,951
Bulletins and Leaflets	12,346
Reprints and Separates	1,945
Translations and Abstracts	490

The number of current periodicals has increased to 384 as against 339 during the last year. Besides 154 yearbooks, bluebooks and annual publications and numerous reports and serials are purchased and a large number is received on exchange.

A classified list of important periodicals is given in Appendix IX. The printed as well as the Dictionary card catalogues are kept up to date. Lists of Additions containing entries for 1937-38 were published and about 3,000 typed cards were added to the catalogue. In addition a bibliography of soil erosion compiled by Dr. R. M. Gorrie was arranged and classified. Part I of this bibliography, which deals with the Indian Section, has been published as a priced bulletin of the Council while part II which deals with the foreign Section, has been stocked in the Library for reference. The back sets of the following periodicals were added:—

1. Recueil de Medicine Veterinaire Exotique Vol. 4: 1931—
2. Bulletin de l'Academic Veterinaire de France. Vol. 1: 1928—
3. Econometrica Vol. I: 1933—
4. Indian Forester volumes for 1906, 1907, 1909, 1910, 1923 and 1926 to 1930.
5. Political and Economic Planning Publications No. 76: 1936-37—

SIMLA;
4th September, 1939.

S. BASU,
Secretary.

APPENDIX I.

IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH, GOVERNING BODY.

1. The Hon'ble Kunwar Sir Jagdish Prasad, K.C.S.I., C.I.E., O.B.E., *Chairman, Imperial Council of Agricultural Research.*
2. Mr. P. M. Kharegat, C.I.E., I.C.S.
3. The Secretary to the Government of India, Department of Education, Health and Lands.
4. The Hon'ble Minister for Agriculture, Madras.
5. The Hon'ble Minister for Agriculture, Bombay.
6. The Hon'ble Minister for Agriculture, Bengal.
7. The Hon'ble Minister for Agriculture, United Provinces.
8. The Hon'ble Minister for Agriculture, Punjab.
9. The Hon'ble Minister for Agriculture, Bihar.
10. The Hon'ble Minister for Agriculture, Central Provinces and Berar.
11. The Hon'ble Minister for Agriculture, Assam.
12. The Hon'ble Minister for Agriculture, North-West Frontier Province.
13. The Hon'ble Minister for Agriculture, Orissa.
14. The Hon'ble Minister for Agriculture, Sind.
15. The Revenue Member to the Government of H. E. H. the Nizam of Hyderabad.
16. The Member in charge of Agriculture, Mysore Executive Council.
17. The Member in charge of Agriculture, Baroda Executive Council, Baroda.
18. The Revenue Minister, Government of Jammu and Kashmir.
19. The Diwan of Travancore.
20. The Diwan of Cochin.
21. The Revenue Member, Bhopal State Council.
22. The Hon'ble Mr. Hosain Imam, Member, Representative of the Council of State.
23. Pandit Sri Krishna Datta Paliwal, M.L.A. } Representatives of the Legislative Assembly.
24. Mr. Mohd. Azhar Ali, M.L.A. }
25. Mr. D. R. Sethi, I.A.S., Director of Agriculture, Bihar. } Representatives of the Advisory Board.
26. Mr. B. K. Badami, Director, Civil Veterinary Department, Hyderabad. }
27. Mr. D. P. Khaitan, Representative of the Federation of Indian Chamber of Commerce and Industry.
28. Mr. R. Scherer, Representative of the Associated Chambers of Commerce of India.
29. Diwan Bahadur Sir T. Vijayaraghavacharya, K.B.E.

Advisory Board.

1. Vice-Chairman, Imperial Council of Agricultural Research—*Chairman.*
2. Agricultural Commissioner with the Government of India.
3. Animal Husbandry Commissioner with the Government of India.
4. A. M. Livingstone, Esq., Agricultural Marketing Adviser to the Government of India.

5. Director, Imperial Agricultural Research Institute, New Delhi.
6. Director, Imperial Veterinary Research Institute, Muktesar.
7. Director, Indian Institute of Science, Bangalore.
8. Director of Agriculture, Madras.
9. Director of Agriculture, Bombay, Poona.
10. Director of Agriculture, Bengal, P. O. Ramna, Dacca.
11. Director of Agriculture, United Provinces, Lucknow.
12. Director of Agriculture, Punjab, Lahore.
13. Director of Agriculture, Bihar, Patna.
14. Director of Agriculture, Central Provinces and Berar, Nagpur.
15. Director of Agriculture, Assam, Shillong.
16. Agricultural Officer, North-West Frontier Province, Peshawar.
17. Director of Development, Orissa, Cuttack.
18. Director of Agriculture, Sind, Karachi.
19. Director of Agriculture, His Exalted Highness the Nizam's Government, Hyderabad-Deccan.
20. Director of Agriculture, Mysore State, Bangalore.
21. Commissioner of Agriculture, Baroda State, Baroda.
22. Director of Agriculture, Cochin State, Trichur.
23. Director of Agriculture and Fisheries, Travancore, Trivandrum.
24. Director of Agriculture and State Chemist, Bhopal State, Bhopal.
25. Director of Agriculture, Government of Jammu and Kashmir, Srinagar.
26. P. T. Saunders Esq., O.B.E., M.R.C.V.S., I.V.S., Director of Veterinary Services, Madras.
27. E. S. Farbrother, Esq., M.R.C.V.S., I.V.S., Director of Veterinary Services, Bombay, Poona.
28. A. D. MacGregor, Esq., F.R.C.V.S., Principal, Bengal Veterinary College, and Veterinary Adviser to the Government of Bengal, Calcutta.
29. T. J. Egan, Esq., M.R.C.V.S., I.V.S., Director, Civil Veterinary Department, United Provinces, Lucknow.
30. Capt. U. W. F. Walker, M.C., M.R.C.V.S., I.V.S., Director of Veterinary Services, Punjab, Lahore.
31. Muhammad Ismail Malik, Esq., Director of Veterinary Services, Bihar, Patna.
32. Rai Bahadur R. V. Pillai, Deputy Director of Veterinary Services, Central Provinces and Berar, Jubbulpore.
33. Rai Sahib Srish Chandra Ghosh, G.B.V.S., Superintendent, Civil Veterinary Department, Assam, Gauhati.
34. Khan Sahib S. M. A. Shah, M.R.C.V.S., Superintendent, Civil Veterinary Department, North-West Frontier Province, Peshawar.
35. J. H. G. Jerrom, Esq., M.R.C.V.S., I.V.S., Director of Veterinary Services, Sind, Karachi.
36. Mr. B. K. Badami, Director of Veterinary Department, His Exalted Highness the Nizam's Government, Hyderabad-Deccan.
37. K Krishniengar, Esq., Superintendent, Civil Veterinary Department, Mysore State, Bangalore.
38. Y. N. Marathe, Esq., G.B.V.C., Deputy Director of Veterinary and Animal Husbandry Science, Baroda State, Baroda.
39. The Senior Veterinary Inspector, Cochin State, Ernakulam.
40. The Revenue Secretary, Bhopal State, Bhopal.
41. Superintendent, Civil Veterinary Department, Government of Jammu and Kashmir, Srinagar.

42. A. M. Mustafa, Esq., Agricultural Officer, in Baluchistan. (Representative of the Minor Administrations under the Government of India), Quetta.

43. The Inspector General of Forests, (Representative of the Forest Research Institute).

44. Diwan Bahadur T. Raghaviah, C.S.I., Graemes Road, Cathedral P. O., Madras. (Representative of the Co-operative Movement).

45. The Public Health Commissioner with the Government of India. (Representative of the Indian Research Fund Association).

46. Dr. J. C. Ghosh, Head of the Department of Chemistry, Dacca University, Dacca.
47. Prof. C. N. Vakil, M.A., M.Sc., F.S.S., University Professor of Economics, Bombay University Bombay.
48. Khan Bahadur Mian M. Afzal Hussain, I.A.S., Vice-Chancellor, Punjab University, Lahore.
49. N. S. Subba Rao, Esq., Vice-Chancellor, Mysore University, Mysore.

} Representatives of the Inter-University Board.

50. P. H. Carpenter, Esq., Director, Indian Tea Association, Scientific Department, Tocklai Experimental Station, Cinnamara (Assam). Representative of the Indian Tea Association and the United Planters' Association of South India.

51. Rao Bahadur Sir Madhav Rao Deshpande, K.B.E., Honorary Magistrate Nagpur. Representative of the Indian Central Cotton Committee.

52. The Director of Veterinary Services in India, Quarter-Master General's Branch, Army Headquarters, Simla.

53. G. T. Tait, Esq., Central Publicity Officer, Indian State Railways, Old Secretariat Buildings, Delhi.

54. Dr. Nazir Ahmad, M.Sc., Ph.D. (Cantab.), Director, Technological Laboratory, Indian Central Cotton Committee, Matunga Bombay.

55. Sardar Bahadur Sardar Datar Singh, Cattle and Dairy Farm, Montgomery.

56. The Hon'ble Maulvi Sir Mohd. Yakub, Member, Council of State, Mohalla Moghulpura, Moradabad.

57. Sir Chunilal V. Mehta, K.C.S.I., Ridge Road, Malabar Hill, Bombay.

58. E. F. G. Gilmore, Esq., Director, Industrial Research Bureau, Indian Stores Department, New Delhi.

59. Raja Jagannath Baksh Singh, M.L.C., Legislative Council, Lucknow.

60. Dr. T. E. Gregory, D.Sc., Economic Adviser to the Government of India, Commerce Department, Simla/New Delhi.

61. J. H. Sprott, Esq., Senior Superintendent, Mangles Brothers, Coovercolly Estate, Somwarpet, Coorg.

S. Basu, Esq., I.C.S. Secretary, Imperial Council of Agricultural Research—*Secretary.*

OFFICE OF THE IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH.

Mr. P. M. Kharegat, C.I.E., I.C.S., *Vice-Chairman.*

Dr. W. Burns, C.I.E., D.Sc., Agricultural Commissioner with the Government of India.

Mr. P. J. Kerr, M.R.C.V.S., I.V.S., Officiating Animal Husbandry Commissioner with the Government of India.

Mr. S. Basu, I.C.S., Secretary.

Rai Bahadur, R. L. Sethi, M.Sc., B.Sc., (Agri.) (Edin.), M.R.A.S., I.A.S., Assistant Agricultural Expert.

Mr. H. B. Shahi, M.Sc., M.R.C.V.S., D.T.V.M., Assistant Animal Husbandry Expert.

Khan Sahib Bazlul Karim, Superintendent.

Mr. S. C. Sarkar, B.A., Superintendent.

Mr. T. S. Krishnamurti, B.A., Superintendent.

Heads of Subordinate offices.

Mr. A. M. Livingstone, M.C., M.A., B.Sc., Agricultural Marketing Adviser to the Government of India.

Mr. R. C. Srivastava, O.B.E., B.Sc., Director, Imperial Institute of Sugar Technology.

Research Officers at Headquarters.

Rao Bahadur Y. Ramachandra Rao, M.A., F.E.S., Locust Research Entomologist.

Rao Bahadur M. Vaidyanathan, M.A., L.T., F.S.S., Statistician.

Annual Accounts for the year 1938-39 relating to the grant for research purposes.

RECEIPTS. PAYMENTS.

Head of accounts.	Receipts during the year.	Grants. Original.	Grants. Net.	Head of account.	Expenditure during the year.	Excess — or Saving + over net grant.	Remarks.
	Rs. A. P.	Rs.	Rs.		Rs. A. P.	Rs. A. P.	
1. Opening balance on 1st April 1938	62,965 11 6	500	250	1. United Provinces Sugarcane seedlings scheme	250 0 0	...	
2. Grant from Central Government for research work :—							
(i) Annual recurring grant	5,00,000 0 0	40,500	25,100	2. Sugarcane Research Station in the Bombay-Deccan	25,122 10 0	—22 10 0	Inconsiderable.
(ii) Grant for Marketing Scheme (Provincial portion).	2,00,000 0 0	27,900	30,800	3. Establishment of Sugarcane Station in Bihar and appointment of a sugarcane specialist	30,800 0 0	...	
(iii) Special grant to meet expenditure on certain activities originally intended to be transferred to Sugar Committee	3,50,000 0 0	17,500	11,400	4. Establishment of a Sub-Section of the Coimbatore Imperial Sugar Station at Karnal	11,366 3 6	33 12 6	,,
(iv) Grant for Sugar Marketing Survey	1,194 10 3	20,100	19,650	5. Grant for research on Mosaic and other cane diseases at I. A. R. I.	19,660 15 0	—10 15 0	,,
		2,300	2,250	6. Sugarcane seedling testing station at Dacca	2,250 0 0	...	
3. Grants from Indian States—							
(i) Baroda Durbar	5,000 0 0	4,700	5,300	7. Grant to the Government of Mysore for breeding thick cane in Mysore	5,303 15 0	—3 15 0	,,
(ii) Cochin Durbar	5,000 0 0			8. Research on the genetics of sugarcane at the Imperial Cane Breeding Station, Coimbatore	7,081 0 0	19 0 0	,,
(iii) Kashmir Durbar	5,000 0 0	7,300	7,100	9. Research on Sugarcane in the Madras Presidency	23,414 11 2	—14 11 2	,,
4. Interest from investments—				10. Research for the establishment of a sugarcane research station for the Punjab.	28,370 0 0	30 0 0	,,
(i) 5 per cent. loan 1939-44	26,770 2 7	18,900	23,400	11. Investigation into various problems of sugar industry in the United Provinces	17,520 5 6	—20 5 6	,,
(ii) Fixed deposits, etc.	17,286 5 0			12. Establishment of Research and Testing station for the indigenous system of *gur* and Sugar Manufacture by the Director, I. I. of S. T.	27,358 3 3	41 12 9	,,
(iii) 2¾ per cent. loan 1948-52 and 3½ per cent. loan 1947-50	30,174 4 0	21,400	28,400	13. Extension of Sugarcane work at the Jorhat Experimental Station, Assam	6,501 12 0	—1 12 0	,,
(iv) 3 per cent. loan 1963-65.	26,467 9 4						
		14,600	17,500				
5. Miscellaneous Receipts—							
(i) Receipts from the Bureau of Sugar Standards	602 7 0	38,300	27,400				
(ii) Receipts on account of unspent balances of grants made by the Council to various Provincial Governments, private persons and Universities	18,490 14 8	2,000	6,500				
(iii) Sale proceeds of Sugar Maps	298 12 0						

Head of account.	Receipts during the year.	Grants. Original.	Grants. Net.	Head of account.	Expenditure during the year.	Excess — or Saving + over net grant.	Remarks.
	Rs. A. P.	Rs.	Rs.		Rs. A. P.	Rs. A. P.	
5. Miscellaneous Receipts—*contd.*							
(iv) Receipts realised by various Provincial Governments from the schemes financed from the funds of the Council	25,850 11 5	5,700	900	14. Bureau of Sugar Standards	882 5 3	17 10 9	Inconsiderable.
(v) Contribution towards cost of the Angora Goat Breeding Scheme	4,687 7 6	...	200	15. Investigation into the cost of production of crops in the principal sugarcane and cotton tracts in India—			
(vi) Receipts of the Hide Improvement Fund	599 12 0	...	...	(*a*) Bombay	210 6 6	—10 6 6	,,
(vii) Other miscellaneous receipts	37,443 1 1	7,500	19,900	(*b*) Bihar	0 9 1	—0 9 1	,,
				16. Appointment of the Chief Economist and staff in connection with the investigations into the cost of production of crops in the Principal Sugarcane and Cotton tracts in India	19,869 12 0	30 4 0	,,
6. Debts and Remittances—							
(i) Refund of loans and advances to Council's servants	1,732 0 0	46,100	30,250	17. Central Sugarcane Insect Pests Scheme	30,240 0 0	10 0 0	,,
(ii) Deposits and advances	894 2 0	,2800	2,800	18. Research on the structural anatomy of sugarcane	2,800 0 0	...	
(iii) Recoveries from the research staff on account of income-tax, provident funds, etc.	4,411 11 0	12,900	*Nil*	19. North-West Frontier Province Sugarcane Scheme	0 0 0	0 0 0	,,
		2,000	750	20. Sugar Committee	726 15 0	23 1 0	,,
		7,300	5,950	21. Chemistry of Sugarcane scheme	5,934 0 0	16 0 0	,,
Total Receipts	13,24,869 8 10	2,200	2,200	22. Grant to the Government of Baroda for investigation of suitable types of cane for Gujrat	2,200 0 0	...	
Receipts on account of repayments of investments and reinvestments	36,59,400 0 0	8,000	4,000	23. Scheme for the utilization of bagasse for the paper and board industry	4,000 0 0	...	
		4,100	5,100	24. Manufacture of Cattle feed from molasses	5,075 1 6	24 14 6	,,
GRAND TOTAL	49,84,269 8 10	8,600	5,500	25. Sugarcane Ratooning Scheme—			
		8,600	3,000	(i) United Provinces	5,500 0 0	...	
				(ii) Bihar	3,000 0 0	...	
		12,000	7,450	26. Sugarcane Insect Pests Scheme in Provinces—			
		...	1,750	(i) United Provinces	7,458 0 0	—8 0 0	,,
		...	1,400	(ii) Mysore	1,760 0 0	—10 0 0	,,
		...	1,000	(iii) Bengal	1,400 0 0	...	
		1,900	*Nil*	(iv) Hyderabad	1,000 0 0	...	
		...	2,000	(v) Headquarters (I. A. R. I.)	1 2 0	—1 2 0	,,
		8,000	130	(vi) Madras	2,000 0 0	...	
		4,000	1,750	(vii) Bihar	125 0 0	5 0 0	,,
				(viii) Bombay	1,750 0 0	...	

	...	800	(ix) Orissa	800	0	0	...			
	...	23,200	27. Sugar Marketing Survey Scheme	23,194	10	3	5	5	9	,,
	6,600	5,060	28. Grant to the Government of the Punjab for the Locust Control measures	5,060	0	0	...			
	40,000	83,300	29. Special staff for research work with headquarters at Karachi	82,343	14	9	956	1	3	,,
	1,000	90	30. Locust Committee	90	7	0	—0	7	0	,,
	800	70	31. Central Locust Bureau	65	7	0	4	9	0	,,
	25,600	23,300	32. Botanical Sub-station at Pusa	23,292	0	0	8	0	0	,,
	33,200	30,900	33. Grant to the Agra College, Agra, for investigation of rusts of wheat and barley	30,896	2	9	3	13	3	,,
	11,400	23,640	34. Agricultural Meteorology, Poona	23,641	13	6	—1	13	6	,,
	4,000	4,000	35. Appointment of Physical Assistant to the staff of Agricultural Chemist, Bengal	4,000	0	0	...			
			36. Co-ordinated Schemes of Rice Research—							
	...	38,500	(*a*) Burma	38,520	0	0	—20	0	0	,,
	12,400	12,400	(*b*) Central Provinces	12,370	0	0	30	0	0	,,
	22,000	21,500	(*c*) Bihar	21,500	0	0	...			
	19,900	17,200	(*d*) Assam	17,170	13	0	29	3	0	,,
	14,000	14,100	(*e*) Bengal	14,100	0	0	...			
	19,900	19,900	(*f*) United Provinces	18,945	1	3	54	14	9	,,
	...	1,620	(*g*) Madras	1,623	4	0	—3	4	0	,,
	21,600	37,600	(*h*) Orissa	37,576	12	0	23	4	0	,,
	1,000	1,250	37. Research work on potatoes in Madras	1,249	10	0	0	6	0	,,
	300	50	38. Chemistry of malting cholam, Madras Scheme	52	4	0	—2	4	0	,,
			39. Malting and Brewing Test of Improved Barleys—							
	3,400	1,800	(*a*) United Provinces	1,800	0	0	...			
	2,000	1,000	(*b*) Punjab	1,000	0	0	...			
	1,200	600	(*c*) Bihar	600	0	0	...			
	22,900	23,050	40. San Jose scale survey in the Punjab which is needed to prevent the pest spreading to other parts of the Punjab, United Provinces and North-West Frontier Province	23,043	0	0	7	0	0	,,
	17,900	16,400	41. Research in systematic cultivation of medicinal plants and study of food poison by Colonel Chopra	16,363	0	0	37	0	0	,,
	17,700	22,200	42. Statistical Section of the Bureau of Agricultural Intelligence	22,203	5	3	—3	5	3	,,
	16,400	15,550	43. Bombay cold storage fruit scheme	15,546	1	3	3	14	9	,,
			44. Dry-farming research schemes—							
	20,200	34,150	(*a*) Bombay-Deccan	34,137	0	0	13	0	0	,,
	15,000	15,000	(*b*) Ceded Districts of Madras	15,069	2	0	—69	2	0	,,
	21,400	21,400	(*c*) South East Punjab	21,400	0	0	...			
	7,100	7,800	(*d*) Hyderabad-Deccan	7,763	5	0	36	11	0	,,
	11,900	10,960	45. H. E. H. the Nizam's Government scheme for the improvement of the castor crop in India	10,960	13	6	—0	13	6	,,

RECEIPTS. PAYMENT.

Head of account.	Receipts during the year.	Grants. Original.	Grants. Net.	Head of account.	Expenditure during the year.	Excess — or Saving + over net grant.	Remarks.
	Rs. A. P.	Rs.	Rs.		Rs. A. P.	Rs. A. P.	
		12,000	19,360	46. Grant to the Imperial Agricultural Research Institute for potato breeding research in Northern India	19,359 0 0	1 0 0	Inconsiderable.
				47. Provincial schemes of Fruit Research—			
		12,800	13,040	(a) Madras	13,039 15 4	0 0 8	,,
		8,000	8,000	(b) Bengal	7,983 0 0	17 0 0	,,
		29,400	27,200	(c) United Provinces	27,200 0 0	...	
		1,700	2,770	(d) Punjab fruits and vegetable preservation	2,765 9 8	4 6 9	,,
		17,300	15,240	(e) Bihar	15,237 0 0	3 0 0	,,
		4,600	*Nil*	(f) Assam	...	...	
		12,700	8,570	(g) Central Provinces	8,570 0 0	...	
		10,400	10,130	(h) Punjab citrus and grape vines	10,126 7 3	3 8 9	,,
		3,300	2,550	(i) North West Frontier Province	2,550 0 0	...	
		3,300	1,650	(j) Hyderabad	1,650 0 0	...	
		9,500	6,600	(k) Mysore	6,600 0 0	...	
		1,100	450	48. Research on the gangai pest of rice in the Central Provinces	452 3 6	—2 3 6	,,
		1,000	1,000	49. Bengal flax fibre scheme	1,000 0 0	...	
		25,800	22,130	50. Tobacco Research—Guntur Sub-station	22,065 3 0	64 13 0	,,
		13,200	2,100	51. Bombay Scheme of research on the virus diseases of plants	8,700 0 0	—6,600 0 0	,,
				52. Oil seed research schemes—			
		9,900	9,900	(a) Linseed—Central Provinces	9,950 0 0	—50 0 0	,,
		4,500	4,500	(b) Linseed—Bengal	4,500 0 0	...	
		6,000	6,000	(c) Rape and mustard—Punjab	5,940 0 0	60 0 0	,,
		14,000	12,400	(d) Groundnuts—Madras	12,402 2 6	—2 2 6	,,
		7,600	7,430	53. Travancore scheme of research on the diseases of the coconut palm in South India	7,430 0 0	...	
		4,000	*Nil*	54. Scheme of research on the microflora of Kallar and alkaline soils in the Punjab	...	...	
		16,900	16,900	55. Fruit canning and preserving laboratory at Quetta	16,900 0 0	...	
				56. Sunn-hemp schemes—			
		400	430	(a) Madras	431 14 0	—1 14 0	,,
		1,900	1,900	(b) Central Provinces	1,907 3 9	—7 3 9	,,

	500	500	(c) Bihar	500	0	0			
	700	700	(d) Bombay	700	0	0	...		
	400	2,120	57. Investigation of India fish poisons and other forest products for their insecticidal properties in Mysore	2,122	0	0	—2	0	0	„
	3,000	2,800	58. United Provinces scheme for the supply of decorticated cotton seed cake for propaganda	2,800	0	0	...			
	...	260	59. Survey of various fruit growing tracts in Baluchistan to determine the distribution and status aspect of the codling moth and *spilonata ocellana*	260	0	0	...			
	200	*Nil*	60. Cloves enquiry	...			...			
	28,000	35,100	61. Cinchona enquiry	35,108	7	9	—8	7	9	„
	7,000	*Nil*	62. Research at the Imperial Agricultural Research Institute on the cytology of Indian crop plants	...			...			
	1,80,000	1,74,500	63. Provincial Marketing schemes	1,74,479	0	0	21	0	0	„
	...	2,640	64. Tobacco Enquiry	2,638	11	0	1	5	0	„
	10,000	5,000	65. Research on coconuts in Madras Presidency	5,000	0	0	...			
	8,300	6,930	66. Research on the Striga attack on Jowar	6,930	0	0	...			
	...	6,850	67. Scheme for the production of strains of rust-resistant wheats	6,847	0	0	3	0	0	„
	23,100	*Nil*	68. Scheme regarding water requirements of crops in the Punjab	...			...			
	9,100	*Nil*	69. Gas storage of fruits and vegetables scheme	...			...			
	9,500	11,550	70. Dacca University scheme of Agricultural Research.	11,554	11	0	—4	11	0	„
	6,500	6,950	71. Prof. Mukherjee's scheme of research into properties of colloid soil constituents.	6,950	0	0	...			
	9,500	10,300	72. Prof. Mahalanobis's scheme of investigation on experimental errors in field trials	10,300	0	0	...			
	2,200	1,920	73. Investigation on the Organic Constituents of Indian soils by Prof. J. C. Ghosh	1,920	0	0	...			
	2,300	*Nil*	74. Investigation for preparation of cheap synthetic manure from town refuse and waste material by the Indian Institute of Science, Bangalore	7	1	9	—7	1	9	„
	800	800	75. Extension of work as "Quality" in crops by the Indian Institute of Science	800	0	0	...			
	3,400	3,190	76. Research on nitrogen loss in soils and nitrogen fixation in soils by Dr. N. R. Dhar	3,190	0	0	...			
	2,100	3,700	77. Research work on Plant Physiology by Dr. Boshi Sen	3,700	0	0	...			

RECEIPTS. PAYMENTS.

Head of account	Receipts during the year.	Grants. Original	Grants. Net.	Head of account.	Expenditure during the year.	Excess — or Saving + over net grant.	Remarks.
	Rs. A. P.	Rs.	Rs.		Rs. A. P.	Rs. A. P.	
		2,900	2,400	78. Research in Agricultural Economics at the Gokhale Institute of Politics and Economics	2,400 0 0	...	
		20,300	20,300	79. Benares University Plant Physiology Scheme	20,296 11 3	3 4 9	Inconsiderable.
		5,600	*Nil*	80. Sewage Farm investigation with special reference to papaya and plantain cultivation	...	...	
		5,200	5,400	81. Dr. Slater's scheme of goat breading, United Provinces	5,395 0 0	5 0 0	,,
		18,000	*Nil*	82. Texicology of Indian Drugs Scheme	...	...	
		12,400	11,880	83. Appointment of a Physiological Chemist to study animal nutrition problem at Dacca	11,880 0 0	...	
				84. Appointment of Veterinary Investigation Officers in :—			
		10,000	10,900	(*a*) Hyderabad-Deccan	10 900 0 0	...	
		10,800	10,150	(*b*) Bombay	10,154 3 0	—4 3 0	,,
		8,800	8,650	(*c*) Bengal	8,650 0 0	...	
		8,600	7,700	(*d*) Punjab	7,700 0 0	...	
		9,000	8,170	(*e*) Bihar	8,172 4 0	—2 4 0	,,
		10,000	7,750	(*f*) Central Provinces	7,750 0 0	...	
		9,800	11,220	(*g*) Madras	11,220 0 0	...	
		6,100	3,470	(*h*) United Provinces	3,465 0 0	5 0 0	,,
		9,500	7,370	(*i*) Assam	7,370 0 0	...	
		8,500	8,330	(*j*) North West Frontier Province	8,330 0 0	...	
		7,500	7,500	(*k*) Sind and Ajmer	7,450 0 0	50 0 0	,,
		10,000	5,000	(*l*) Orissa	5,000 0 0	...	
		8,900	9,900	85. All-India Animal Husbandry Bureau	9.912 2 9	—12 2 9	,,
		1,100	4,440	86. Research on the composition of milk at the Allahabad Agriculture Institute	4,436 9 0	3 7 0	,
		1,100	1,100	87. Investigation of Johne's diseases among cattle in Mysore.	1,100 0 0	...	
		9,200	8,970	88. Extension of work on animal nutrition in the Madras Presidency	8,970 0 0	...	
		7,800	*Nil*	89. Punjab indigenous goat-breeding scheme	...	...	

		4,500	4,370	90. Research on warble flies	4,365	0	0	5	0	0	..
		4,000	1,990	91. Grant to the Government of the Punjab for investigation of indigenous sheep breeding	1,990	0	0	...			
		16,400	15,400	92. Feeding of cattle on departmental farms, United Provinces	15,400	0	0	...			
		6,800	6,500	93. Grant to the Government of Bombay for a scheme of research in poultry husbandry to be conducted in the Bombay Presidency	6,493	6	6	6	9	6	,,
		5,000	4,830	94. Scheme for the Government of Bihar on the analysis of foodstuffs for cattle	4,830	0	0	...			
		2,200	2,110	95. Fresh water fishes scheme, Bengal	2,110	0	0	...			
		2,300	1,430	96. Improvement of poultry for table purposes (Punjab)	1,430	0	0	...			
		7,000	7,000	97. Bombay Sheep Breeding Scheme	6,940	0	0	60	0	0	,,
		37,700	*Nil*	98. Scheme for investigation of Tuberculosis and Johne's disease, Imperial Veterinary Research Institute	...			...			
		...	750	99. Scheme for the training of a scholar in Animal Genetics in the United Kingdom	742	8	0	7	8	0	,,
		9,200	*Nil*	100. Grant to the I. V. R. I., Muktesar, for the appointment of a research officer and staff for investigation into contagious abortion in cattle, goats and sheep	...			...			
		8,100	*Nil*	101. Grant to the I. V. R. I., Muktesar, for research into diseases of poultry in Bengal	...			...			
		3,800	4,100	102. Enquiry into the helminthiasis of cattle, sheep and goats in the United Provinces	4,100	0	0	...			
		300	150	103. Establishment of pedigree herd books	153	14	0	—3	14	0	,,
		8,500	7,410	104. Appointment of a systematic Protozoologist, I. V. R. I., Muktesar	7,405	0	0	5	0	0	,,
		36,000	*Nil*	105. Revised scheme for carrying on research work in the Anand Creamery in the manufacture of products and bye-products of milk	...			...			
		8,400	*Nil*	106. Angora goat-breeding scheme	...			...			
		5,100	2,800	107. Madras Sheep-breeding scheme	2,800	0	0	...			
		12,000	5,000	108. Control of ticks scheme, Bombay	5,000	0	0	...			
		...	4,500	109. Grant for continuance of I. D. D. Course	4,500	0	0	...			
		...	50	110. Scheme for the formation of milk-recording societies, United Provinces	47	0	0	3	0	0	,,
		7,700	*Nil*	111. Feeding value of certain foodgrains, oilseeds, and cakes, etc.	...			...			
		...	2,150	112. Purchase of films for cattle	2,142	9	0	7	7	0	,,

Head of account.	Receipts during the year.	Grant. Original.	Grant. Net.	Head of account.	Expenditure during the year.	Excess — or Saving + over net grant.	Remarks.
	Rs. A. P.	Rs.	Rs.		Rs. A. P.	Rs. A. P.	
		10,000	10,000	113. Contribution to the expedition organised by the Executive Council of the Imperial Agricultural Bureau to South America for collecting new species and forms of solanum	10,000 0 0	...	
		700	*Nil*	114. Deputation to the 11th World Dairy Congress	...	...	
		2,000	3,450	115. Deputation to the Rural Hygiene Conference, Bandeong, Java, 1937	3,442 5 0	7 11 0	Inconsiderable.
		...	2,390	116. Deputation to the 12th International Horticultural Conference	2,385 5 11	4 10 1	,,
		2,500	700	117. Participation of India at the International Veterinary Congress, Zurich and Interlasken, August, 1938	689 1 10	10 14 2	,,
		3,600	3,600	118. Contribution to the International Office of Epizootics, Paris (7,500 francs)	3,567 14 3	32 1 9	,,
		13,000	14,500	119. International Institute of Agriculture, Rome, at 16,000 gold francs (about Rs. 13,000) per annum	14,492 13 4	7 2 8	,,
		55,700	*Nil*	120. Imperial Agricultural Bureau, London	...	...	
		23,700	11,870	121. Imperial Mycological Institute 122. Imperial Institute of Entomology, London 123. Contribution towards maintenance of the laboratory for collecting, lending and despatching beneficial parasites at Farnham House and investigation into the control of insects and moulds injurious to stored products at Slough	11,866 10 8	3 5 4	,,
		300	670	124. Contribution to the Tobacco Federation of the British Empire, at £10 (about Rs. 135) per annum	666 10 8	3 5 4	,,
		150	150	125. Contribution to the British Empire Organization, Coffee Section	140 0 0	10 0 0	,,

		500	500	126. Contribution to the Indian Academy of Sciences, Bangalore . .	500 0 0	...		
		500	500	127. Contribution to the National Institute of Science, Calcutta . .	500 0 0	...		
		500	500	128. Contribution to the National Academy of Sciences, Allahabad .	500 0 0	...		
		...	670	129. Fruit Preservation Research Station, Campden . . .	666 10 8	3 5 4		,,
		4,700	2,360	130. Contribution to the Imperial Bureau of Dairy Science . .	2,362 8 0	—2 8 0		,,
		9,600	6,369	131. Books and Publications . .	6,358 3 3	1 12 9		,,
		1,000	870	132. Editorial Committee . . .	868 4 0	1 12 0		,,
		9,000	7,770	133. Accounts and Audit . . .	7,772 2 9	—2 2 9		,,
		2,000	2,680	134. Miscellaneous	2,685 14 1	—5 14 1		,,
		9,000	4,720	135. T. A. of non-official members of the I. C. A. R. . . .	4,717 0 0	3 0 0		,,
		6,000	4,730	136. T. A. of visitors	4,727 10 0	2 6 0		,,
		500	50	137. Award of a medal for improvement in Agriculture and Animal Husbandry	50 3 3	—0 3 3		,,
		...	660	138. Scientific Review of the Research Progress of the I. C. A. R. .	744 15 0	—84 15 0		,,
		2,500	280	139. Scheme for studying and supervising the work of grading stations for agricultural produce . .	279 0 0	1 0 0		,,
		...	1,900	140. Punjab Cold Storage Scheme .	1,895 0 0	5 0 0		,,
		63,250	9,680	141. Grant for the development of refrigerated rail transport . .	9,675 14 6	4 1 6		,,
		...	680	142. Agricultural and Veterinary Survey in Coorg	683 12 0	—3 12 0		,,
		...	30	143. Refund of the share of the late Empire Marketing Board in the receipts from the Bengal Rice Research Scheme . . .	33 11 11	—3 11 11		,,
		1,500	410	144. Deposits and advances repayable .	638 14 0	—228 14 0		,,
		2,500	4,500	145. Remittances of income-tax, provident funds, etc. . . .	4,484 15 0	15 1 0		,,
				Total Expenditure .	16,38,274 2 11			
				Investment and re-investment in fixed deposit	32,84,334 0 0			
				By Balance . .	61,661 5 11			
	49,84,269 8 10			GRAND TOTAL .	49,84,269 8 10			

II. Particulars of Advances outstanding at the end of the year—

Particulars.	*Amount.* Rs. a. p.
(*a*) Permanent advance with Locust Research Entomologist	1,500 0 0
(*b*) Permanent advance with Secretary, Imperial Council of Agricultural Research	250 0 0
Total .	1,750 0 0

III. Particulars of Securities, etc.—

	Face value. Rs.	Purchase value. Rs.	A.	P.	(Approximate market value on 31st March 1939).
1. 3½ per cent. loan of 1947-50 (kept with the Reserve Bank of India, Calcutta) . .	5,50,000	5,91,495	1	0	Rs. 5,72,000 (at Rs. 104 for Rs. 100).
2. 2½ per cent. loan of 1948-52 (kept with the Reserve Bank of India, Calcutta) . .	4,00,000	4,02,736	9	0	Rs. 3,94,000 (at Rs. 98-8-0 for Rs. 100).
3. Three per cent. stock, 1963-65 (kept with the Reserve Bank of India, Calcutta) . .	16,49,500	15,54,334	0	0	Rs. 16,03,100 (at Rs. 97-3-0 for Rs. 100).
4. Three fixed deposit receipts Nos. 4076 to 4078, dated 13th June 1938 for one year at 1½ per cent. for Rs. one lakh each .	3,00,000	3,00,000	0	0	
5. Two fixed deposit receipts Nos. 4144-4145, dated 12th August 1938 bearing interest at ¼ per cent. and repayable at a week's notice for Rs. 50,000 each . . .	1,00,000	1,00,000	0	0	
6. Four fixed deposit receipts Nos. 4170 to 4173, dated 22nd September 1938 bearing interest at ¼ per cent. and repayable at a week's notice for Rs. 50,000 each . .	2,00,000	2,00,000	0	0	
7. Two fixed deposit receipts Nos. 4175-4176, dated 29th September 1938 bearing interest at ¼ per cent. and repayable at a week's notice for Rs. 50,000 each . .	1,00,000	1,00,000	0	0	
8. Two fixed deposit receipts Nos. 4233-4234, dated 27th February 1939 bearing interest at ¼ per cent. and repayable at a week's notice for Rs. 65,000 each . . .	1,30,000	1,30,000	0	0	
9. Ten five-year post office cash certificates, dated 25th September 1935	10,000	8,625	0	0	

IV. Particulars of closing balance—

	Rs. a. p.
Cash in current account with the Imperial Bank of India, Simla	54,164 13 10
Cash in current account with the Imperial Bank of India, New Delhi . . .	7,496 8 1
Total .	61,661 5 11

S. BASU,
Secretary,
Imperial Council of Agricultural Research.

The accounts have been examined and according to the best of my information, as a result of the test-audit of the books of the Imperial Council of Agricultural Research, and consideration of the explanations given, the accounts are correct, subject to the remarks made in my Report of June 1939.

MOHAN BEHARI LAL,
Examiner,
Outside Audit Department.

APPENDIX III.

Financial resources of the Imperial Council of Agricultural Research, allocation of funds and actual expenditure on research upto 31st March, 1939.

Funds received and receivable 1929-30 to 1938-39.		Funds allocated.				
		Name of Scheme.	Sanctioned grant.	Date of termination.	Actual expenditure up to 1938-39.	Balance due after 1938-39.
1		2	3	4	5	6
	Rs.		Rs.		Rs.	Rs.
1. *Government grants*—		*A.—Rice.*				
(*a*) General .	78,60,400	1 Botanical Sub-station	2,63,930	30-9-40	2,03,190	60,740
		2 Co-ordinated schemes of rice research in Provinces	11,91,390	*	10,90,630	1,00,760
(*b*) Sugar . .	29,14,200	3 Extension of work on "Quality" in crops at the Indian Institute of Science.	10,750	31-8-38†	9,570	1,180
2. Donations from Indian States up to 1938-39.	3,40,000	Total .	14,66,070	..	13,03,390	1,62,680
		B.—Wheat.				
3. Miscellaneous Income Receipts and recoveries.	19,15,300	4 Investigation into rusts of wheat and barley .	2,56,480	31-3-40	2,15,280	41,200
		5 Scheme for the production of strains of rust-resistant wheats.	22,050	May '41	6,850	15,200
		Total .	2,78,530		2,22,130	56,400

*Rice Research Scheme, Orissa 30-6-40
Rice Research Scheme, Central Provinces 31-3-39
Rice Research Scheme, Bihar 19-1-40
Rice Research Scheme, Bengal 31-3-40
Rice Research Scheme, United Provinces 31-3-39
Rice Research Scheme, Assam 31-3-39

† Scheme extended further.

Funds received and receivable 1929-30 to 1938-39.	Funds allocated.				
	Name of Scheme.	Sanctioned grant.	Date of termination.	Actual expenditure up to 1938-39.	Balance due after 1938-39.
1	2	3	4	5	6
		Rs.			
	C.—Other cereals (Barley, Jowar, etc.)				
	6. Scheme regarding malting and brewing qualities of Barleys in the (1) United Provinces, (2) Punjab, and (3) Bihar and Orissa.	18,160	1938-39*	15,060	3,100
....	7. Research into the Striga attack on Jowar .	21,600	26-5-43	6,930	14,670
	Total .	39,760		21,990	17,770
	D.—Fruit.				
....	8. Bombay Cold Storage Fruit Scheme . .	1,40,420	29-2-40	1,20,720	19,700
....	9. Baluchistan fruit-canning and preserving scheme	49,600	January'43	20,700	28,900
....	10. Scheme regarding the gas storage of fruits and vegetables.	13,450	To be combined with No. 8.	..	13,450
....	11. Fruit and vegetable research schemes in (1) Madras, (2) Bengal, (3) Punjab, (4) United Provinces, (5) Bihar, (6) Central Provinces, (7) Assam, (8) North West-Frontier Province, (9) Hyderabad and (10) Mysore.	6,77,010	(1) 29-2-40 (2) 31-3-40 (3) 1941 (4) 9-7-39† (5) 2-4-39† (6) 29-4-42 (7) 6-9-43 (8) 1943 (9) 1943 (10) 30-6-43	4,12,790	2,64,220

....	12. Entomological Survey in the Punjab and North-West Frontier Province.	48,500	31-3-39†	41,710	6,790
		9,28,980		5,95,920	3,33,060
	E.—Fibres.				
....	13. Investigation into the method of extraction of flax fibres in Bengal.	5,000	31-3-41	3,230	1,770
....	14. Investigation into sunn-hemp cultivation in (1) Madras, (2) Bombay, (3) Central Provinces and (4) Bihar.	17,360	(1) 7-4-40 (2) 10-1-40 (3) 10-1-42 (4) 3-1-41	7,990	9,370
	Total .	22,360		11,220	11,140
	F.—Oilseeds.				
....	15. Improvement of castor crop by H. E. H. the Nizam's Government.	61,050	4-8-39	43,070	17,980
....	16. Linseed research in Bengal	21,880	30-9-41	10,500	11,380
....	17. Linseed research in the Central Provinces .	52,280	9-2-42	19,780	32,500
....	18. Punjab rape and mustard research Scheme .	36,070	31-8-41	17,900	18,170
....	19. Groundnut research in Madras . . .	57,100	21-1-42	24,890	32,210
....	20. Supply of decorticated cotton-seed cake for educative propaganda.	10,000	November 1940.	3,300	6,700
....	21. Research on coconuts in the Madras Presidency	43,040	14-9-43	5,000	38,040
....	22. Investigation of the "Root" disease of the Coconut Palm in South India . .	29,880	May 1940	16,330	13,550
	Total .	3,11,300		1,40,770	1,70,530
..	*G.—Coffee.* *Nil.*	*Nil*	*Nil*	*Nil*	*Nil*

* Details awaited from the High Commissioner for India.

† Schemes extended further.

Funds received and receivable 1929-30 to 1938-39.	Funds allocated.				
	Name of Scheme.	Sanctioned grant.	Date of termination.	Actual expenditure up to 1938-39.	Balance due after 1938-39.
1	2	3	4	5	6
		Rs.		Rs.	Rs.
	H.—Potatoes.				
....	23. Potato breeding research in Northern India .	92,430	March 1940	80,050	12,380
	Total .	92,430		80,050	12,380
	I.—Tobacco.				
....	24. Research on Cigrette Tobacco at Guntur .	1,05,920	August 1941	58,740	47,180
....	25. Training of officers in tobacco cultivation and research.	25,500	1940-1941	2,640	22,860
	Total .	1,31,420		61,380	70,040
	J.—Pan Cultivation.				
....	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*
	K.—Soil Studies.				
....	26. Grant to Dacca University for Agricultural Research.	91,770	30-6-40	76,630	15,140
....	27. Professor Mukerjee's scheme of research into properties of colloid soil constituents.	81,370	31-10-43	38,130	43,240

....	28. Appointment of a physical assistant on the staff of the Agricultural Chemist, Bengal.	34,890	30-6-40	27,500	7,390
....	29. Investigation into the organic constituents of Indian Soils by Professor J. C. Ghosh.	11,200	November 39*.	9,580	1,620
....	30. Preparation of cheap synthetic manure from town refuse and waste materials.	14,500	1-1-40	6,900	7,600
....	31. Dr. Dhar's scheme regarding Nitrogen fixation in soils.	9,360	31-7-39	8,210	1,150
....	32. Research on the water requirements of crops in the Punjab.	71,400	April 1942	..	71,400
	Total .	3,14,490		1,66,950	1,47,540
	L.—Plant Physiology.				
....	33. Research on plant physiology by Dr. Boshi Sen	8,300	13-9-30*	8,220	80
....	34. Research in the physiology of cane and wheat at the Benares Hindu University.	67,920	31-3-42	31,900	36,020
	Total .	76,220		40,120	36,100
	M.—Protection of Crops.				
	(a) Locusts.				
....	35. Punjab Locust Research Scheme . . .	37,820	31-3-39	35,200	2,620
....	36. Appointment of Special Locust Research Staff with headquarters at Karachi.	6,77,080	31-3-39*	6,77,080	..
....	37. Locust Committee	3,980	31-3-39*	3,980	..
	Total .	7,18,880		7,16,260	2,620

* Since extended.

Funds received and receivable 1929-30 to 1938-39.	Funds allocated.				
	Name of Scheme.	Sanctioned grant.	Date of termination.	Actual expenditure up to 1938-39.	Balance due after 1938-39.
1	2	3	4	5	6
	M. Protection of Corps—contd.	Rs.		Rs.	Rs.
	(b) Plant Diseases.				
....	38. Investigation of virus diseases of plants .	80,470	1944	23,790	56,680
	Total .	80,470		23,790	56,680
	N.—Dry Farming.				
....	39. Research Schemes in (1) Madras, (2) Bombay, (3) Punjab and (4) Hyderabad.	5,69,320	(1), (3) and (4) 31-3-40 (2) October 38.*	4,52,460	1,16,860
	Total .	5,59,320		4,52,460	1,16,860
	O.—Insecticides and medicinal plants.				
....	40. Scheme regarding the systematic cultivation of medicinal plants and study of food poisons by Col. Chopra.	76,060	April 1940	54,180	21,880
	Total .	76,060		54,180	21,880
	P.—Miscellaneous.				
....	41. Scheme regarding Statistical Studies and experimental errors in field trials by Professor P. C. Mahalanobis.	54.000	30-6-39*	51,430	2,570

....	42. Research on Agricultural Meteorology . .	1,79,780	1940	1,40,500	39,280
....	43. Statistical section of the Bureau of Agricultural Intelligence.	1,25,560	*30-11-40	1,06,930	18,630
....	44. Research in Agricultural Economics at the Gokhale Institute of Politics and Economics.	7,200	30-6-39	6,690	510
....	Total .	3,66,540	..	3,05,550	60,990
....	Total Agricultural Schemes .	54,72,830	..	41,96,160	12,76,670
	ANIMAL HUSBANDRY SCHEMES.				
	A.—Animal Pests and Diseases and Cure.				
	1. Appointment of Veterinary Investigation Officers in Provinces (12 schemes).	6,35,700	N.-W. F. P. 6-7-40 Sind 1-1-42 Orissa April 1939* 9 others 31-3-39.*	5,36,870	98,830
....	2. Investigation of Johne's disease among cattle in Mysore.	23,460	31-7-40	20,400	3,060
....	3. Research on warble flies	29,170	31-12-41	8,060	21,110
....	4. Investigation of tuberculosis and Johne's disease among animals at the Imperial Veterinary Research Institute, Mukteswar.	1,02,250	..	..	1,02,250
....	5. Investigation into contagious abortion in cattle, goats and sheep.	83,470	..	..	83,470
....	6. United Provinces Helminthiasis Scheme .	21,160	9-2-42	7,700	13,460
....	7. Appointment of a systematic protozoologist at the Imperial Veterinary Research Institute.	40,200	17-8-41	19,600	20,600
....	8. Research on the control of ticks in the Bombay Presidency.	35,700	14-1-42	5,000	30,700
....	9. Research into the indigenous drugs of India with special reference to their toxicology.	39,000	31-3-42	..	39,000
	Total .	10,10,110	..	5,97,630	4,12,480

* Since extended.

Funds received and receivable 1929-30 to 1938-39.	Funds allocated.				
	Name of Scheme.	Sanctioned grant.	Date of termination.	Actual expenditure up to 1938-39.	Balance due after 1938-39.
1	2	3	4	5	6
		Rs.		Rs.	Rs.
	B.—Dairying.				
	10. Research on the composition of milk . .	12,900	30-6-39	11,990	910
....	11. Research at the Anand creamery into the manufacture of products and bye-products of milk.	95,860	(Postponed)	3,240	92,620
....	12. Grant for the continuance of the Indian Dairy Diploma Course.	12,000	1940	4,500	7,500
....	13. Scheme regarding the formation of milk-recording Societies.	5,760	1941	50	5,710
	Total .	1,26,520	..	19,780	1,06,740
	C.—Cattle Feeding.				
....	14. Practical Research into feeding of cattle on departmental farms.	1,01,520	April, 1943	22,800	78,720
....	15. Scheme regarding feeding of minerals to cattle in Bihar and Orissa.	25,470	30-9-41	12,190	13,280
....	16. Scheme for determining the feeding values of certain food grains, oil seeds and cakes for working bullocks and dairy cattle.	22,840	1-10-42	..	22,840
	Total .	1,49,830	..	34,990	1,14,840

	D.—Goat and Sheep breeding.				
17.	Dr. Slater's scheme of goat breeding . .	61,990	5-6-41	51,160	10,830
18.	Indigenous sheep-breeding scheme, Punjab .	43,000	Oct. 1946 .	10,190	32,810
19.	Bombay sheep-breeding scheme . . .	76,390	31-10-47	20,840	55,550
20.	Madras sheep-breeding scheme . . .	18,000	22-10-43	2,800	15,200
21.	Punjab goat-breeding scheme . . .	18,720	Postponed	..	18,720
22.	Angora goat-breeding scheme . . .	13,120	1939-40.	..	13,120
	Total .	2,31,220	..	84,990	1,46,230
	E.—Animal Nutrition.				
23.	Appointment of a physiological chemist to study animal nutrition at Dacca.	1,35,860	31-12-41	85,730	50,130
24.	Extension of work on animal nutrition in the Madras Presidency.	49,930	31-3-40	33,920	16,010
	Total .	1,85,790	..	1,19,650	66,140
	F.—Poultry.				
25.	Poultry husbandry scheme, Bombay . .	43,740	30-9-41	28,610	15,130
26.	Research in the improvement of Poultry for the table purposes in Northern India.	12,370	Nov. 1942	2,130	10,240
27.	Research into the diseases of Poultry in Bengal (I. V. R. I.).	37,500	1944	..	37,500
	Total .	93,610	..	30,740	62,870
	G.—Fish.				
28.	Research in fresh water fishes in Bengal .	6,620	30-11-39	5,010	1,610
	Total .	6,620	..	5,010	1,610
	H.—*Veterinary and dairy training and scholarships.*				
29.	Training of a scholar in Animal Genetics in the United Kingdom.	9,000	1941	740	8,260
	Total .	9,000	..	740	8,260

Funds received and receivable 1929-30 to 1938-39.	Funds allocated.				
	Name of Scheme.	Sanctioned grant.	Date of termination.	Actual expenditure up to 1938-39.	Balance due after 1938-39.
1	2	3	4	5	6
		Rs		Rs.	Rs.
	I.—Animal husbandry.				
....	30. All-India Animal Husbandry Bureau . .	65,420	10-4-42	34,180	31,240
	Total .	65,420	..	34,180	31,240
	Total Animal Husbandry Schemes .	18,78,120	..	9,27,710	9,50,410
	GENERAL SCHEMES.				
	A.—Contributions to International and Imperial Bureaux of Agriculture and Veterinary Research and Indian Institute of Science.				
....	1. Contribution to the International Office dez Epizootics, Paris.	24,210	Annual charge.	24,210	*Nil.*
....	2. Contribution to the International Institute of Agriculture, Rome.	1,32,690	Do.	1,32,690	*Nil.*
....	3. Contribution to the Imperial Agricultural Bureaux.	1,39,190	1941-42.	27,820	1,11,370
....	4. Contribution to the Imperial Institute of Mycology.				
....	5. Contribution to the Imperial Institute of Entomology.				
....	6. Contribution towards maintenance of the laboratory for collecting, lending and despatching beneficial parasites at Farnham House and investigation into the control of insects and moulds injurious to stored products at Slough.	59,410	1941-42.	11,870	47,540

7. Contribution to the Imperial Bureau of Dairy Science.	11,820	1941-42.	2,360	9,460
8. Contribution to the Fruit Preservation Research Station, Campden.	2,000	1940-41.	670	1,330
9. Grant to the Indian Academy of Sciences, Bangalore.	3,000	1940-41.	2,000	1,000
10. Grant to the National Institute of Sciences of India, Calcutta.	3,000	1940-41.	2,000	1,000
Total .	3,75,320	..	2,03,620	1,71,700
B.—Deputation of India's Representatives to International, etc., Conferences.				
11. Deputation to the Eleventh World Dairy Congress, Berlin.	2,000	Finished. But further debits awaited from the High Commissioner for India.	1,440	560
12. Deputation to the 13th International Veterinary Congress, Zurich and Interlaaken.	1,000		690	310
13. Deputation to the 12th International Horticultural Conference.	2,500	..	2,380	120
Total .	5,500	..	4,510	990

Funds received and receivable 1929-30 to 1938-39.	Funds allocated.				
	Name of Scheme.	Sanctioned grant.	Date of termination.	Actual expenditure up to 1938-39.	Balance due after 1938-39.
1	2	3	4	5	6
		Rs.		Rs.	Rs.
....	*C.—Headquarters Miscellaneous Schemes, etc.*				
....	14. Books and Publications . . .	59,370		59,370	..
....	15. Editorial Committee	4,700	Annual charges.	3,700	1,000
....	16. Accounts and Audit	73,350		73,350	..
....	17. Miscellaneous	12,030		12,030	..
....	18. T. A. of non-official members of the Council .	52,040	Annual charges.	52,040	..
....	19. T. A. of visitors for attending meetings of the Advisory Board and the Committees of the Council.	45,120		45,120	..
....	20. Award of medals for improvements in Agriculture and Animal Husbandry.	1,850	1942-43	600	1,250
....	Agriculture and Veterinary Survey of Coorg .	4,280	Completed but payments to be made in 1939-40.	690	3,590
	Total .	2,52,740		2,46,900	5,840
	Total General Schemes .	6,33,560	..	4,55,030	1,78,530

	Sugar Research Schemes. ***A.—Testing, Agricultural and Manurial Experiments.***				
....	1. Grant to Shajahanpur Research Station for examination and study of sugarcane seedlings.	11,230	Aug. 1941	9,770	1,460
....	2. Bombay-Deccan Sugarcane Research Scheme	5,10,600	5-6-40	4,28,140	82,460
....	3. Establishment of a sugarcane research station in Bihar and appointment of a Sugarcane Specialist.	3,10,250	17-3-40	2,58,480	51,770
....	4. Scheme for the establishment of a sub-station of the Coimbatore Imperial Sugarcane Station at Karnal.	1,32,000	31-3-39*	99,590	32,410
....	5. Sugarcane Seedling Testing Station, Dacca .	24,850	11-11-41	16,820	8,030
....	6. Madras Sugarcane Research Scheme . .	1,24,020	31-3-39*	1,18,930	5,090
....	7. Sugarcane Research Station, Punjab . .	1,37,100	31-3-39*	1,35,340	1,760
....	8. Investigation into various problems of Sugar Industry, United Provinces.	1,10,820	31-3-39*	1,05,340	5,480
....	9. Extension of Sugarcane work at the Jorhat Experimental Station, Assam.	54,500	31-3-39*	54,500	..
....	10. Sugarcane Research in North-West Frontier Province.	63,750	Sept. 1943	1,800	61,950
....	11. Scheme regarding manufacture of cattle feed from molasses.	11,860	31-3-39*	10,040	1,820
....	12. Planning of experiments on ratooning of sugarcane in (1) United Provinces and (2) Bihar.	59,000	(1) 31-12-43 (2) 18-3-44	8,500	50,500
	Total .	15,49,980	..	12,47,250	3,02,730

* Since extended.

Funds received and receivable 1929-30 to 1938-39.	Funds allocated,				
	Name of Scheme.	Sanctioned grant.	Date of termination.	Actual expenditure up to 1938-39.	Balance due after 1938-39.
1	2	3	4	5	6
		Rs.		Rs.	Rs.
	B.—Technology, Gur-making, etc.				
....	13. Establishment of a Research and Testing Station for the indigenous system of gur and sugar manufacture by the Director, Imperial Institute of Sugar Technology.	1,67,380	31-10-41	1,03,810	63,570
....	14. Scheme for a Bureau of Sugar Standards .	32,610	29-2-40	16,180	16,430
	Total .	1,99,990	..	1,19,990	80,000
	C.—Sugarcane Pests and Diseases.				
....	15. Research on Mosaic and other cane diseases at I. A. R. I., New Delhi.	1,45,880	31-5-39	1,21,010	24,870
....	16. Research on Insect Pests of Sugarcane (Central).	83,500	Decr. 1939*	58,780	24,720
....	17. Sugarcane Insect Pests Scheme (Provincial) .	1,08,640	1940-41	16,300	92,340
	Total .	3,38,020	..	1,96,090	1,41,930

	D.—Morphology, Cytology, Cane-breeding and Genetics.				
....	18. Grant to Mysore Darbar for breeding thick canes.	26,660	31-3-39*	23,380	3,280
....	19. Research on the Genetics of Sugarcane at the Imperial Cane-breeding Station, Coimbatore.	37,400	25-5-39*	35,950	1,450
....	20. Research on the morphology and anatomy of Sugarcane Sorghum hybrids and of the Indian Sugarcane.	8,600	14-3-40	5,260	3,340
....	21. Research on the Chemistry of Sugarcane .	23,000	4-5-40	8,240	14,760
....	22. Investigation of suitable types of cane for Gujrat.	11,300	31-10-41	5,900	5,400
	Total .	1,06,960	..	78,730	28,230
	E.—Marketing Survey.				
....	23. Sugar Marketing Survey Scheme . . .	46,000	31-12-39	23,190	22,810
	Total .	46,000	..	23,190	22,810
	F.—Miscellaneous.				
....	24. Chief Economist and the staff in connection with the Economic Enquiry into the cost of production of crops in the principal sugarcane and cotton tracts in India.	1,42,210	28-2-40	1,39,710	2,500
....	25. Sugar Committee	42,410	Recurring Annual charge.	42,410	..
....	26. Utilization of bagasse for paper and board industry.	15,000	Non-recurring grant.	11,000	4,000
	Total .	1,99,620	..	1,93,120	6,500
	Total Sugar Research Schemes .	24,40,570	..	18,58,370	5,82,200

* Since extended.

Funds received and receivable 1929-30 to 1938-39.	Funds allocated.			
	Name of Scheme.	Sanctioned grants.	Expenditure upto 1938-39.	Balance due after 1938-39.
		Rs.	Rs	Rs.
Brought forward . 1,30,29,900	*Totals*	..	..	..
	Agriculture	54,72,830	41,96,160	12,76,670
	Animal Husbandry	18,78,120	9,27,710	9,50,410
	General	6,33,560	4,55,030	1,78,530
	Sugar	24,40,570	18,58,370	5,82,200
	Total Schemes in progress .	1,04,25,080	74,37,270	29,87,810
Total . . 1,30,29,900 .	Total completed schemes *	22,09,860	22,09,860	..
	Grand total .	1,26,34,940	96,47,130	29,87,810
	Unallotted balance	3,94,960	..	..
	Total .	1,30,29,900	..	..

* Schemes completed before 31st March 1939 (and not since extended).

APPENDIX IV.

Personnel of the Rice Committee, 1938-39.

1. The Vice Chairman, Imperial Council of Agricultural Research, Chairman, *ex-officio.*
2. The Agricultural Expert, Imperial Council of Agricultural Research.
3. The Agricultural Marketing Adviser to the Government of India.
4. The Economic Adviser to the Government of India.
5. The Senior Marketing Officer (Rice).
6. The Statistician, Imperial Council of Agricultural Research.
7. The Director of Agriculture, Madras.
8. The Director of Agriculture, Bombay Presidency, Poona.
9. The Director of Agriculture, Bengal, Dacca.
10. The Director of Agriculture, United Provinces, Lucknow.
11. The Director of Agriculture, Bihar.
12. The Director of Agriculture, Central Provinces.
13. The Director of Agriculture, Assam.
14. The Director of Agriculture, Sind.
15. The Director of Agriculture, Hyderabad.
16. The Director of Agriculture, Mysore.
17. The Director of Agriculture, Travancore.
18. The Director of Agriculture, Cochin.
19. The Commissioner of Agriculture, Baroda.
20. The Director of Development, Orissa.
21. The Hon'ble Mr. Hossain Imam.

22-29. Eight representatives of rice growers, one each from Madras, Bombay, Bengal, United Provinces, Bihar, Central Provinces, Assam and Orissa.

Madras—M. R. Ry. B. Venkataratnam, Chodavaram, East Godavari District.

Bombay.—Mr. G. D. Vartak of Virar, District Thana.

Bengal. Babu Monmohan Singha Ray, Makalpur, District Hooghly.

United Provinces.—Mr. Prayag Dhawaj Singh, B.A., LL.B., M.L.A., Deorea, Gorakhpur.

Bihar.—Babu Jamuna Prasad Singh, M.L.A., Gaya.

Central Provinces.—Pandit W. B. Lakha, B.A., Malguzar, Raipur.

Assam.—Mr. Kashinath Saikia, *ex*-M.L.C., Laitumkhrah, Shillong.

Orissa.—Mr. Sarangdhar Das, B.A. (Calf., U. S. A.), Chandni Chowk, Cuttack,

30. The Paddy Specialist, Madras.
31. The Crop Botanist, Bombay.
32. The Economic Botanist, Bengal.
33. The Economic Botanist (Rice), United Provinces.
34. The Rice Specialist, Bihar.
35. The Officer-in-Charge, Rice Research Station, Central Provinces.
36. The Economic Botanist, Assam.
37. The Paddy Specialist, Orissa.

38-39. Two Professors of Economics—(Selection)—

Professor P. J. Thomas, Professor of Indian Economics, Madras University.

Dr. H. L. Dey, Professor in the Department of Economics and Politics, Dacca University.

40. A representative of the Associated Chamber of Commerce—

Rai Upendralall Ray Bahadur, Parade Square, Chittagong.

41. A representative of the Federation of the Indian Chamber of Commerce and Industry.

Mr. Ashutosh Bhattacharyya, 69-A, Chetla Road, P. O. Alipore, Calcutta.

42. One Wholesale Rice Merchant—(Selection)—

Mr. N. Rangaswami Reddyar, Rice Merchant, Kuttalam, Tanjore District.

43. One Rice Miller—(Selection)—

Mr. B. K. Roy, Calcutta.

M. R. Ry. C. V. Padmanabha Ayyangar, Bheemannampet, Mylapore (Additional member).

44-45. Two Trade representatives, one each from Madras and Bengal.

Madras.—K. P. V. S., Mohamed Meera Rowther Sahib Bahadur, Merchant and Agent, Negapatam.

Bengal.—Mr. M. A. Ispahani, President, Muslim Chamber of Commerce, Calcutta.

Secretary, Imperial Council of Agricultural Research, Secretary *ex-officio*.

APPENDIX V.

List of members of the Joint Sub-Committee on Field Experiments, and Manurial Experiments.

1. The Vice-Chairman, Imperial Council of Agricultural Research, Chairman, *ex-officio.*
2. The Agricultural Expert, Imperial Council of Agricultural Research.
3. Mr. P. H. Carpenter, Chief Scientific Officer, Indian Tea Association, Tocklai Experiment Station, Cinnamara, P. O., Assam.
4. Mr. P. B. Richards, Director of Agriculture, United Provinces, Lucknow.
5. Dr. B. P. Pal, M.Sc., Ph.D. (Cantab.), F. L. S., Imperial Economic Botanist, Imperial Agricultural Research Institute, New Delhi.
6. Prof. P. C. Mahalanobis, M.A., I.E.S., Statistical Laboratory, Presidency College, Calcutta.
7. Rao Bahadur M. Vaidyanathan, M.A., L.T., Statistician, Imperial Council of Agricultural Research, New Delhi.
8. The Statistician, Imperial Agricultural Research Institute, New Delhi.
9. Mr. A. M. Mustafa, Agricultural Officer, Baluchistan, Quetta.
10. Dr. R. J. Kalamkar, Assistant Director of Agriculture, Central Provinces, Nagpur.
11. Dr. L. A. Ramdas, Agri. Meteorologist, I. Met. Deptt., Poona 5.
12. Mr. K. L. Khanna, Sugarcane Specialist, Pusa, Bihar.
13. Dr. J. K. Basu, Soil, Physicist Padegaon, Post, Nira R. S. Bombay Presidency.
14. Dr. B. N. Singh, Irvin Prof., of Agri., Instt. of Agri. Research, Benares Hindu University, Benares.
15. Mr. D. R. Sethi, Director of Agriculture, Bihar, Patna.
16. Mr. H. R. Stewart, D.A., Punjab, Lahore.
17. R. B. R. L. Sethi, A.A.E., I. C. A. R.,
18. Mr. B. B. Dave, Rice Research Officer, C. P., Raipur.

Secy., I. C. A. R., *Secy. ex-officio.*

APPENDIX VI.

Personnel of the Animal Nutrition Committee (Reconstituted in July 1938.)

1. The Vice-Chairman, Imperial Council of Agricultural Research.
2. The Animal Husbandry Expert, Imperial Council of Agricultural Research.
3. Dr. P. E. Lander, Agricultural Chemist, Punjab, Lyallpur.
4. Dr. K. C. Sen, Officer-in-Charge, Animal Nutrition Section, Izatnagar.
5. Rao Bahadur B. Viswanath, Director, Imperial Agricultural Research Institute, New Delhi.
6. Mr. J. R. Haddow, Director, Imperial Veterinary Research Institute, Mukteswar.
7. Mr. Zal R. Kothavala, Imperial Dairy Expert, Bangalore.
8. The Director, Imperial Veterinary Research Institute, Mukteswar.
9. The Director of Veterinary Services, Army Headquarters, Simla.
10. The Director, Nutrition Research, Indian Research Fund Association, Coonoor.
11. The Director of Veterinary Services, Punjab, Lahore.
12. Mr. M. Carbey, Director of Agriculture, Bengal, Calcutta.
13. Dr. J. K. Dubey, Director of Agriculture, Bhopal.
14. The Director of Veterinary Services, Bengal, Calcutta.
15. The Director of Veterinary Services, Bombay.
16. Dr. Burch H. Schneider, Allahabad, Agricultural Institute, Allahabad.
17. The Director of Veterinary Services, United Provinces, Lucknow.
18. Mr. C. H. Parr, Deputy Director of Agriculture, Bundelkhand Circle, Jhansi. United Provinces.
19. Mr. P. V. Ramiah, Agricultural Chemist, Coimbatore.
20. Rao Sahib D. V. Bal, Agricultural Chemist, Central Provinces and Berar.
21. Major C. E. McGuckin, Assistant Director of Military Dairy Farms, Northern Circle, Lahore Cantt.

Personnel of the Cattle Breeding Committee (Reconstituted in July 1938.)

1. The Vice-Chairman, Imperial Council of Agricultural Research.
2. The Animal Husbandry Expert, Imperial Council of Agricultural Research.
3. The Director of Veterinary Services, Punjab, Lahore.
4. Major McGuckin, Assistant Director of Military Dairy Farms, Northern Circle, Lahore Cantonment.
5. Mr. E. J. Bruen, Livestock Expert, Bombay.
6. Khan Sahib Chowdhury Dost Mohammad Khan, Proprietor, Jahangirabad Cattle Farm, Jahangirabad.
7. Mr. C. H. Parr, Deputy Director of Agriculture, Bundelkhand Circle, Jhansi, U. P.
8. Mr. Zal R. Kothavala, Imperial Dairy Expert, Bangalore.
9. The Director of Veterinary Services, Bihar, Patna.
10. Mr. Wynne Sayer, Imperial Agricultural Research Institute, New Delhi.
11. The Director of Veterinary Services, United Provinces, Lucknow.
12. The Senior Marketing Officer, in charge of Livestock.
13. Sardar Bahadur Sardar Datar Singh, Montgomery Dairy Farm, Montgomery.
14. Mr. K. P. R., Kartha, Animal Husbandry Bureau, Imperial Council of Agricultural Research,
15. Mr. F. J. Gossip. Livestock Expert, Bengal, Dacca.
16. The Superintendent, Civil Veterinary Department, North-West Frontier Province, Peshawar.
17. The Livestock Development Officer, Madras, Hosur.

18. Mr. J. V. Takle, Extra Assistant Director, Animal Husbandry, Central Provinces and Berar, Nagpur.
19. Mr. R. C. Woodford, Deputy Director of Agriculture (Livestock), Assam, Shillong.
20. Sardar Santokh Singh, Civil Lines, Jullundur City.
21. The Director, Imperial Veterinary Research Institute, Mukteswar.
22. Mr. N. R. Kothawala, Ellis Bridge, Ahmedabad.
23. Sir Chunilal V. Mehta, Queens Mansions, Prescott Road, Bombay.
24. The Director of Agriculture, Mysore.
25. Pattagar of Palayakotai, Palayakotai, *via* Erode.
26. The Director, Civil Veterinary Department, Hyderabad (Deccan).
27. The Assistant Director of Veterinary Services, Orissa.
28. The Superintendent, Civil Veterinary Department, Assam.
29. The Livestock Officer, Sind, Karachi.
30. Lt.-Col. MacLean, Deputy Director of Agriculture, Bihar, Patna.
31. The Deputy Director of Animal Husbandry, Baroda.
32. The Director of Agriculture, Travancore.
33. The Superintendent, Civil Veterinary Department, Kashmir.

Personnel of the Dairying Committee (Reconstituted in July 1938).

1. The Vice-Chairman, Imperial Council of Agricultural Research.
2. The Animal Husbandry Expert, Imperial Council of Agricultural Research.
3. The Imperial Dairy Expert, Bangalore.
4. The Director of Military Farms (or Representative), Army Headquarters, Simla.
5. Mr. W. Keventer, Messrs. Keventer and Co., Aligarh.
6. Mr. R. C. Woodford, Deputy Director of Agriculture (Livestock), Assam, Shillong.
7. Mr. E. J. Bruen, Livestock Expert, Bombay.
8. The Livestock Development Officer, Madras, Hosur.
9. The Director, Imperial Veterinary Research Institute, Mukteswar.
10. Mr. A. C. Aggarwala, Professor of Animal Husbandry, Veterinary College, Lahore.
11. Mr. J. V. Takle, Extra Assistant Director, Animal Husbandry, Central Provinces and Berar, Nagpur.
12. Mr. W. Sayer, Imperial Agricultural Research Institute, New Delhi.
13. Sardar Bahadur Sardar Datar Singh, Montgomery Dairy Farm, Montgomery.
14. Mr. F. J. Gossip, Livestock Expert, Bengal, Dacca.
15. Dr. Burch H. Schneider, Allahabad Agricultural Institute, Allahabad.
16. Mr. D. N. Khurody, Agricultural Marketing Adviser's Office.
17. Mr. C. H. Parr, Deputy Director of Agriculture, Bundelkhand Circle, Jhansi, United Provinces.
18. Lt.-Col. MacLean, Deputy Director of Agriculture, Bihar, Patna.

APPENDIX VII.

PUBLICATIONS OF THE IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH, INDIA

[Prices are inclusive of packing and Indian postage]

1. Agriculture and Live-stock in India.

ICAR. 1. A bi-monthly journal of agriculture and animal husbandry for the general reader interested in agriculture or live-stock in India or the Tropics. (Established 1931. Published in January, March, May, July, September and November. Prepayable subscription Rs. 6 or 9*s* 9*d*. per annum. Price per part Rs. 2 or 3*s*. 6*d*.). Volumes I to VIII complete are available.

2. The Indian Journal of Agricultural Science

ICAR. 5. A bi-monthly scientific journal of agriculture and the allied sciences. mainly devoted to the publication of the results of original research and field experiments. (Established 1931. Published in February, April, June, August, October and December. Prepayable subscription Rs. 15 or 24*s*. per annum. Price per part Rs. 3 or 5*s*. 3*d*.). Volumes I to VIII complete are available.

3. The Indian Journal of Veterinary Science and Animal Husbandry.

ICAR. 6. A quarterly journal for the publication of scientific matter relating to the health, nutrition and breeding of live-stock. (Established 1931. Published in March, June, September and December. Prepayable subscription Rs. 6 or 9*s*. 9*d*. Price per part Rs. 2 or 3*s*. 6*d*.). Volumes I to VIII complete are available.

4. Scientific Monographs of the Imperial Council of Agricultural Research

ICAR. 10-1 No. 1. The Fungi of India. By E. J. Butler, C.I.E., D.Sc., M.B., F.R.S., and G. B. Bisby, PH.D. (1931). Price Rs. 6-12-0 or 11*s*.

ICAR. 10-2 No. 2. Life-histories of Indian Microlepidoptera, Second Series; Alucitidæ (Peterophoridæ, Tortricina and Gelechiadæ). By T. Bainbrigge Fletcher, R. N., F.L.S., F.E.S., F.Z.S. (1932). Price Rs. 3-4-0 or 5*s*. 6*d*.

ICAR. 10-3 No. 3. The Open Pan System of White-Sugar Manufacture. By R. C. Srivastava, B.Sc. (1935, 2nd edition). Price Rs. 3-2 or 5*s*. 6*d*.

ICAR. 10-4 No. 4. Life histories of Indian Microlepidoptera; Cosompterygidæ to Neopseustidæ. By T. Bainbrigge Fletcher, R. N., F.L.S., F.E.S., F.Z.S. (1933). Price Rs. 4-8-0 or 7*s*. 6*d*.

ICAR. 10-5 No. 5. The Bombay Grasses. By E. J. Blatter, S. J., PH.D., F.L.S., and C. McCann, F.L.S. Illustrated by R. K. Bhide. (1935). Price Rs. 20-12-0 or 32*s*. 6*d*.

ICAR. 10-6 No. 6. Helminth Parasites of the Domesticated Animals in India. By G. D. Bhalerao, M.Sc. (1935). Price Rs. 7-12-0 or 13*s*. 3*d*.

ICAR. 10-7 No. 7. Influence of Manures on the Wilt Disease of *Cajanus indicus* Spreng., and the Isolation of Types Resistant to the Diseases. By W. McRae, M.A., D.Sc. (Edin.), F.L.S. and F.J.F. Shaw D Sc. (Lond.), A.R.C.S., F.L.S. (1933). Price Rs. 2-4-0 or 4*s*. 3*d*.

ICAR. 10-8 No. 8. The Silk Industry of Japan with Notes on Observations in the United States of America, England, France and Italy. By C. C. Ghosh, B.A., F.E.S. (1933). Price Rs. 4 or 6*s.* 9*d.*

ICAR. 10-9 No. 9. Mechanical Cultivation in India. A History of the Large-scale Experiments carried out by Burmah-Shell Oil Storage and Distributing Company of India, Ltd. By C. P. G. Wade. (1935). Price Rs. 3-14-0 or 6*s.* 6*d.*

ICAR. 10-10 No. 10. The Sopotted Boll-Worms of Cotton (*Earias fabia* Stoll and *Earias insulana* Boisd) in South Gujarat, Bombay Presidency. (Final report on investigations financed by the Indian Central Cotton Committee, 1923-1931). By B. P. Deshpande, M.Ag. and N. T. Nandkarny, B.Ag. (1936). Price Rs. 5-14-0 or 9*s.* 6*d.*

ICAR. 10-11 No. 11. Investigation on the Course and Distribution of the Nerves supplying Levator anguli scapuli and Rhomboideus muscles and the formation of the Phrenic Nerve in the Ox with Observations on certain Anatomical Deviations. By H. N. Chelva Ayyangar, G.M.V.C. (1937). Price Rs. 4-10-0 or 7*s.* 9*d.*

ICAR. 10-12 No. 12. The Fungi of India, Supplement I. By B. B. Mundkur (1938). Price Re. 1-6-0 or 2*s.* 3*d.*

ICAR. 10-13 No. 13. Further Observations on Anatomical Deviations in the Ox and Notes on certain Anatomical Freaks. By H. N. Chelva Ayyangar, G.M.V.C. (*In Press*).

5. Miscellaneous Bulletins of the Imperial Council of Agricultural Research

ICAR. 8-1 No. 1. List of Publications on Indian Entomology, 1930. Compiled by the Imperial Entomologist, Pusa. (1934). Price As. 14 or 1*s.* 6*d.*

ICAR. 8-2 No. 2. List of Publications on Indian Entomology, 1931. Compiled by the Imperial Entomologist, Pusa. (1934). Price As. 8 or 10*d.*

ICAR. 8-3 No. 3. List of Publications on Indian Entomology, 1932. Compiled by the Imperial Entomologist, Pusa. (1934). Price As. 12 or 1*s.* 3*d.*

ICAR. 8 4 No. 4. Host Plant Index of Indo-Ceylonese Coccidæ. By S. Ramachandran. L.Ag. and T. V. Ramakrishna Ayyar, B.A., PH.D, F.Z.S. (1934). Price Re. 1-10-0 or 2*s.* 9*d.*

ICAR. 8-5 No. 5. List of Publications on Indian Entomology, 1933. Compiled by the Officiating Imperial Entomologist, Pusa. (1935). Price As. 9 or 1*s.*

ICAR. 8-6 No. 6. Bee-keeping. By C. C. Ghosh, B.A., F.R.E.S. (4th edition). Price Re. 1-14 or 2*s.* 9*d.*

ICAR. 8-7 No. 7. List of Publications on Indian Entomology, 1934. Compiled by the Imperial Entomologist, Pusa. (1935). Price Re. 1-2-0 or 2*s.*

ICAR. 8-8 No. 8. Selected Clinical Articles, Part I. By G. K. Sharma, G.P.V.C. and R. L. Kaura, B.V.Sc., M.R.C.V.S. (1936). Price As. 8 or 10*d.*

ICAR. 8-9 No. 9. Statistical Methods and their Application to Agronomy; A bibliography. Compiled by K. K. Guha Roy, B.A. (1936). Price Rs. 2-2-0 or 4*s.*

ICAR. 8-10 No. 10. Diseases of Sugarcane and Methods for their Control. By L. S Subramaniam. (1936). Price Re. 1-14-0 or 3*s.* 3*d.*

ICAR. 8-11 No. 11. Tables of Standard Errors of Mendelian Ratios. Compiled by Swarn Singh Purewal, M.Sc., Ph.D. and Krishna Rao, L.Ag. (1936). Price As. 12 or 1*s.* 3*d.*

ICAR. 8-12 No. 12. List of Publications on the Botany of Indian Crops, Part II for the period 1928-32. Compiled by R. D. Bose, B.Sc. (1936). Price Rs. 3-6-0 or 5*s.* 9*d.*

ICAR. 8-13. No. 13. Two New Statistical Tables based upon Fisher's '*t*'. By M. Vaidyanathan, M.A. (1936). Price As. 6 or 8*d.*

ICAR. 8-14 No. 14. List of Publications on Indian Entomology (1935). Compiled by the Imperial Entomologist, Pusa. (1936). Price Re. 1-4-0 or 2*s.*

ICAR. 8-15 No. 15. Selected Clinical Articles, Part III. By G. K. Sharma R. L. Kaura; S. Ganapathy Iyer; G. S. Khan, and M. Y. Mangrulkar, (Edin.) (1937). Price Re. 1-4-0 or 2*s*.

ICAR. 8-16 No. 16. Indian Grazing Conditions and the Mineral Contents of some Indian Fodders. By P. E. Lander, M.A., D.Sc., F.I.C., I.A.S. (1937). Price Rs. 3-14-0 or 6*s*. 9*d*.

ICAR. 8-17 No. 17. A Brief Survey of some of the important Breeds of Cattle in India. By Col. Sir Arthur Olver, C.B., C.M.G., F.R.C. V.S. F.N.I. (1938). Price Rs. 2 or 3*s*. 6*d*.

ICAR. 8-18 No. 18. Milk Records of Cattle in Approved Dairy Farms in India. By K. P. R. Kartha, B.A. (1938). Price Rs. 2-12-0 or 4*s*. 6*d*.

ICAR. 8-19 No. 19. A Preliminary Annotated List of the Fruit Pests of the North-West Frontier Province. By Hem Singh Pruthi, M.Sc., Ph.D. (Cantab.) F.N.I. and H. N. Batra, B.Sc., Assoc. I.A.R.I. (1938). Price Re. 1 or 1*s*. 9*d*.

ICAR. 8-20 No. 20. Report on an Enquiry into the Cultivation of Cloves in India. By A. K. Yegna Narayana Iyer, M.A. (Madras), Dip. Agri. (Ctab). N. D. D. (England) (1938). Price Rs. 2-4-0 or 3*s*. 9*d*.

ICAR. 8-21 No. 21. Investigations on the Cold Storage of Mangoes. By G. S. Cheema, D.Sc., I.A.S., D. V. Karmarkar, M.Sc., Ph.D., A.I.I.Sc. and B. M. Joshi, M.Sc. (1939). Price Rs. 3-12-0 or 6*s*.

ICAR. 8-22 No. 22. Report on a village Enquiry regarding Cattle and the Production and Consumption of Milk in Seven Breeding Tracts of India (1939). Price Rs. 3-8-0 or 5*s*. 6*d*.

ICAR. 8-23 No. 23. The Cold Storage of Fruits and Vegetables. By G. S. Cheema, D.Sc., I.A.S. and D. V. Karmarkar, M.Sc., Ph.D., A.I.I.Sc. (1939). Price As. 10 or 1*s*.

ICAR. 8-24 No. 24. A brief Survey of some of the Important Breeds of Cattle in India Part II. Prize Winners at the First All-India Cattle Show (1939). Price Re. 1-6-0 or 2*s*.

ICAR. 8-25 No. 25. The Nutritive values of Indian Cattle Foods and the Feeding of Animals. By K. C. Sen, D.Sc. (1938). Price As. or 8*d*.

ICAR. 8-26 No. 26. The Progress of Agricultural Science in India during the Past Twenty five years. By W. Burns, C.I.E., D.Sc. (Edin.), I.A.S. (1939). Price Re. 1-8-0 or 2*s*. 3*d*.

ICAR. 8-27 No. 27. Definition of Characteristics of Seven Breeds of Cattle of All-India Importance. (1939). Price Re. 1-10-0 or 2*s*. 6*d*.

ICAR. 8-28 No. 28. Bibliography of Soil Erosion. By R. M. Gorrie. (1939. Price Re. 1-12-0 or 2*s*. 6*d*.

ICAR 8-29 No. 29. Report on the Prospects of Cinchona Cultivation in India. By A. Wilson, M.A., B.Sc., I.A.S. and T. J. Mirchandani, M.Sc. Ph.D. (1939). Price Rs. 2-6-0 or 2*s*. 6*d*.

ICAR. 8-30. No. 30. Biological Notes on Indian Chalcidoidea. By Hem Singh Pruthi, M.Sc., Ph.D. (Cantab). F.N.I. and M. S. Mani. (*In Press*).

ICAR. 8-31. No. 31. Studies in the Preservation of Fruit and Vegetables: An Investigation on the Methods of Preparation and Standardization of Tomato Ketchup. By Lal Singh, B.Sc. (Hons.) M.Sc. (Calif.) and Girdhari Lal, Ph.D. (London), D.I.C. (*In Press.*).

ICAR. 8-32 No. 32. Studies in the Preservation of Fruit Juices, I. Some Observations on the preparation and preservation of Citrus Fruit Squashes. By LWl Singh, B.Sc. (Hons.), M.Sc. (Calif.) and Girdhari Lal, Ph.D. (Lond.), D.I.C. (*In Press*).

6. Annual Report of the Imperial Council of Agricultural Research

ICAR. 1 2-31 Annual Report of the Imperial Council of Agricultural Research for the years 1929-30 and 1930-31. Price As. 12 or 1*s*. 3*d*.

ICAR. 12-32 Annual Report of the Imperial Council of Agricultural Research for the year 1931-32. Price As. 6 or 8*d*.

ICAR. 12-33 Annual Report of the Imperial Council of Agricultural Research for the year 1932-33. Price As. 6 or 8*d*.

ICAR. 12-34 Annual Report of the Imperial Council of Agricultural Research for the year 1933-34. Price Re. 1-8-0 or 2*s*. 6*d*.

ICAR. 12-35 Annual Report of the Imperial Council of Agricultural Research for the year 1934-35. Price Re. 1 or 1*s*. 9*d*.

ICAR. 12-36 Annual Report of the Imperial Council of Agricultural Research for the year 1935-36. Price As. 14 or 1*s*. 6*d*.

ICAR. 12-37 Annual Report of the Imperial Council of Agricultural Research for the year 1936-37. Price Re. 1-2-0 or 2*s*.

ICAR. 12-38 Annual Report of the Imperial Council of Agricultural Research for the year 1937-38. Price As. 12 or 1*s*.

7. Agriculture and Animal Husbandry in India (called Review of Agricultural Operations in India up to 1933)

ICAR. 9-29 Review of Agricultural Operations in India, 1928-29. Price Rs. 3-2-0 or 5*s*. 6*d*.

ICAR. 9-31 Review of Agricultural Operations in India, 1929-31. Price Rs. 5-0-0 or 8*s*. 3*d*.

ICAR. 9-33 Review of Agricultural Operations in India, 1931-33. Price Rs. 5-12-0 or 9*s*. 6*d*.

Agriculture and Animal Husbandry in India, 1933-34 and 1934-35—

ICAR. 13-35 Part I.—Crop Production. Price Rs. 4-14-0 or 8*s*.

ICAR. 13-2-35 Part II.—Animal Husbandry. Price Re. 1 or 1*s*. 9*d*.

ICAR. 13-36 Agriculture and Animal Husbandry in India, 1935-36. Price Rs. 4-10 or 7*s*. 9*d*.

ICAR. 13-37 Agriculture and Animal Husbandry in India, 1936-37. (1939). Price Rs. 7 or 11*s*.

8. Proceedings of the Board of Agriculture and Animal Husbandry.

ICAR. 2 Proceedings of the First Meeting of the Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry held at New Delhi from the 20th to the 23rd February 1933, with Appendices. Price Rs. 5-14-0 or 9*s*. 6*d*.

ICAR. 2-2 Proceedings of the Second Meeting of the Animal Husbandry Wing of the Board of Agriculture and Agriculture and Animal Husbandry. December 1936 (1938).held at Madras from the 14th to the 16th. Price Rs. 3-10 or 6*s*. 3*d*.

ICAR. 3 Proceedings of the First Meeting of the Crops and Soils Wing of the Board of Agricultural and Animal Husbandry in India held at Delhi from the 25th February to the 2nd March 1935, with Appendices. Price Rs. 6 or 9*s*. 9*d*.

ICAR. 3-2. Proceedings of the Second Meeting of the Crops and Soils Wing of the Board of Agriculture and Animal Husbandry in India held at Lahore from the 6th to 9th December 1937, with Appendices. (1939). Price Rs. 4-2 or 6*s*. 6*d*.

9. Marketing Series (Agricultural Marketing in India)

AMA. 1. Report on the Marketing of Wheat in India (1937). Price Rs. 1-4 or 2*s*.

AMA. 2. Report on the Cold Storage and Transport of Perishable Produce in Delhi (1937). Price As. 12 or 1*s*. 3*d*.

AMA. 3. Agricultural Produce (Grading and Marking) Act, 1937, with rules made prior to 1st April 1937 (1937). Price As. 2.

AMA. 4. Report on the Marketing of Wheat in India (Abridged edition). (1938). Price As. 8 or 10*d*.

AMA. 5. Report on the Marketing of Wheat in India. Hindi version (1938). Price As. 8 or 10*d*.

AMA. 6. Ditto. Urdu version (1938). Price As. 8 or 10*d*.

AMA. 7. Annual Report of the Agricultural Marketing Adviser and Summarised Reports of the Senior Marketing Officers in Provinces and certain States for the year ending 31st December 1937. (1938). Price As. 6 or 8*d*.

AMA. 8. Report on the Marketing of Linseed in India 1938. Price Re. 1 or 2*s*.

AMA. 9. Report on the Marketing of Eggs in India and Burma (1938). Price Re. 1-4 or 2*s*.

AMA. 10. Report on the Marketing of Tobacco in India and Burma (1939). Price Re. 1-4 or 2*s*.

AMA. 12. Report on the Marketing of Linseed in India (Abridged edition). (1939). Price As. 8 or 10*d*.

10. Miscellaneous

VRI. 1. A Description of the Imperial Institute of Veterinary Research, Mukteswar, and its Sub-station, the Imperial Veterinary Serum Institute, Izatnagar. By F. Ware, F.R.C.V.S., I.V.S. Price Re. 1-4-0 or 2*s*.

ARI. 7-187 The Production of Cigarette Tobacco by Flue-curing. By F. J. F. Shaw, C.I.E., D.Sc., A.R.C.S., F.L.S. and Kashi Ram. *Imp. Inst. Agri. Res., Pusa Bull.* No. 187. Reprinted (1935). Price Re. 1 or 1*s*. 9*d*.

ICAR. 16. A Handbook of Statistics for use in Plant Breeding and Agricultural Problems. By F. J. F. Shaw, C.I.E., D.Sc., A.R.C.S., F.L.S. Price Rs. 4-6-0 or 7*s*. 3*d*.

ICAR. 7. Report on the Work of the Imperial Council of Agricultural Research in Applying Science to Crop Production in India. By Sir John Russell, D.Sc., F.R.S. Price Re. 1-14 or 3*s*. 3*d*.

ICAR. 18. Report on the Development of the Cattle and Dairy Industries of India By Norman C. Wright M.A., D.Sc., Ph.D. Price Re. 1-8-0 or 2*s*. 6*d*

ICAR. 19-I. Report on the Cost of Production of Crops in the Principal Sugarcane and Cotton Tracts in India, Vol. I. The Punjab (1938). Price Rs. 13-6 or 21*s*. 6*d*.

ICAR. 19-II. Report on the Cost of Production of Crops in the Principal Sugarcane and Cotton Tracts in India. Vol. II. Bombay, (1938). Price Rs. 10-12 or 17*d*.

ICAR. 19-III. Report on the Cost of Production of Crops in the Principal Sugarcane and Cotton Tracts in India. Vol. III. United Provinces (1939). Price Rs. 12-4 or 19*s*.

ICAR. 19-IV. Report on the Cost of Production of Corps in the Principal Sugarcane and Cotton Tracts in India. Vol. IV. Madras (1938). Price Rs. 9-4-or 14*s*. 6*d*.

ICAR. 19-V Report on the Cost of Production of Corps in the Principal Sugarcane and Cotton Tracts in India. Vol. V. Bihar (1938). Price Rs. 8-4 or 13*s*.

ICAR. 19-VI. Report on the Cost of Production of Crops in the Principal Sugarcane and Cotton Tracts in India. Vol. VI. Bengal (1938). Price Rs. 6-10 or 10*s*. 3*d*.

ICAR. 19-VIII. Report on the Cost of Production of Crops in the Principal Sugarcane and Cotton Tracts in India. Vol. VIII. Sind (1939). Price Rs. 4 or 6*s*. 6*d*.

11. Catalogue of Indian Insects

The following Parts have been issued :—

ICAR. 11-1 1. Acrydidæ (Tettigidæ), by T. Bainbrigge Fletcher. 1921. Price As. 11.

ICAR. 11-2 2. Culicidæ, by R. Senior-White. 1923. Price Re. 1-10.

ICAR. 11-3	3. Bombyliidæ, by R. Senior-White 1923. Price As.
ICAR. 11-4	4. Trypetidæ (Trypaneidæ), by R. Senior-White. 1924. Price As. 8.
ICAR. 11-5	5. Nitidulidæ, by S. N. Chatterjee. 1924. Price As. 10.
ICAR. 11-6	6. Staphylinidæ, by M. Cameron. 1925. Price Re. 1-14.
ICAR. 11-7	7. Lasiocampidæ, by T. Bainbrigge Fletcher. 1925. Price As. 12.
ICAR. 11-8	8. Amatidæ (Syntomidæ), by T. Bainbrigge Fletcher. 1925. Price As. 12.
ICAR. 11-9	9. Zygænidæ, by T. Bainbrigge Fletcher. 1925. Price Re. 1-5.
ICAR. 11-10	10. Stephanidæ, by G. R. Dutt. 1925. Price Rs. 1-2.
ICAR. 11-11	11. Bronthidæ, by Richard Kleine. 1926. Price Re. 1-2.
ICAR. 11-12	12. Tabanidæ, by R. Senior-White. 1927. Price Re. 1-12.
ICAR. 11-13	13. Cicindelidæ, by Mercia Heynes-Wood and Cedric Dover. 1928. Price Rs. 2-8.
ICAR. 11-14	14. Palpicornia, by A. d'Orchymont. 1928. Price Rs. 2-8.
ICAR. 11-15	15. Cecidomyæ, by R. Senior-White. 1928. Price As. 7.
ICAR. 11-16	16. Cosmoxterygidae, by T. Bainbridgge Fletcher. 1928. Price As. 10.
ICAR. 11-17	17. Yponomeutidæ, by T. Bainbrigge Fletcher. 1928. Price As. 8.
ICAR. 11-18	18. Carabidæ, by H. E. Andrewes. 1931. Price Rs. 8-10.
ICAR. 11-19	19. Gyrinoideæ, by George Ochs. 1930. Price As. 12.
ICAR. 11-20	20. Alucitidæ (Pterophoridæ), by T. Bainbrigge Fletcher. 1931 Price Re. 1-6.
ICAR. 11-21	21. Lycidæ, by R. Kleine. 1931. Price Re. 1-2.
ICAR. 11-22	22. Phaloniadæ and Chilidanotidæ, by T. Bainbrigge Fletcher. 1931. Price As. 6.
ICAR. 11-23	23. Chalcidoidea, by M. S. Mani, M.A. (Res.), 1937. Price Rs. 3-2 or 5*s*. 6*d*.
ICAR. 11-24	24. Evanidæ, by M. S. Mani, M.A. (*In Press*).

Copies of the above publications can be had from the Manager of Publications, Civil Lines, Delhi and from any of the Agents, a list of whom will be found on the inside page of the front cover. Prices are inclusive of packing and Indian postage.

Purchasers not residing in Asia, should apply to the High Commissioner for India, India House, Aldwych, London.

Note.—When indenting please give only the symbol preceding the name of the publisation.

APPENDIX VIII.

Books and Publications received as Library exchanges.

Names of countries.	Number of books and publications, etc., received.	Number of periodicals received.
1. Afghanistan	..	1
2. Africa	103	7
3. Argentine	22	3
4. Australia	44	3
5. Austria	1	1
6. Belgium	17	2
7. Brazil	..	6
8. British Guiana	..	1
9. Burma	28	1
10. Canada	74	3
11. Ceylon	102	2
12. China	9	2
13. Cyprus	4	1
14. Czechoslovakia	..	1
15. Denmark	5	1
16. Dutch East Indies	8	2
17. Fiji	2	1
18. Finland	28	1
19. France	6	
20. Germany	1	6
21. Great Britain	448	40
22. Holland	43	2
23. India—		
(*a*) Central and Local Governments	664	20
(*b*) Private bodies and States	155	70
24. Indo-China	1	1
25. International Institute of Agriculture, Rome	103	10
26. Italy	6	4
27. Japan	..	3
28. League of Nations	98	8
29. Malta	1	..
30. New Zealand	23	2
31. Norway	5	2
32. Palestine	8	1
33. Panama	8	..
34. Philippines	28	4
35. Romania	..	4
36. Russia	28	10
37. Straits Settlement and Federated Malay States	18	5
38. Sweden	..	1
39. United States of America	977	9
40. West Indies	36	6
Total	3,104	253

APPENDIX IX.

List of Journals received in the Library, Imperial Council of Agricultural Research.

Agricultural Engineering.

1. AGRICULTURAL ENGINEERING. (1937—).
2. IMPLEMENT AND MACHINERY REVIEW (England). Vol. 55. (1930 —).

Agriculture.

3. AGRICOLTURA COLONIALE (Italy). Vol. 28. (1934 —).
4. AGRICULTURA SINICA (China). Vol. 1. (1934 —).
5. AGRICULTURAL GAZETTE OF NEW SOUTH WALES. (VOL. 42. 1933 —).
6. AGRICULTURAL INDEX. (U. S. A.). (1916 —).
7. AGRICULTURAL JOURNAL, Fiji. Vol. 3. (1930 —).
8. AGRICULTURAL JOURNAL OF BRITISH GUIANA, Vol. 1. (1929 —).
9. AGRICULTURE NOTES (PUERTO RICO AGRIL. EXP. STATION). (1936—).
10. AGRICULTURE AND ANIMAL HUSBANDRY IN INDIA 1933-34—(CONTINUATION of REVIEW OF AGRICULTURAL OPERATION IN INDIA. 1919 TO 1932—33).
11. AGRICULTURE AND LIVE-STOCK IN INDIA. Vol. 1. (1931 —).
12. ALLAHABAD FARMER. Vol. 4. (1930 —).
13. ANNALS OF THE AGRICULTURAL COLLEGE OF SWEDEN.
14. BERICHTE DES O.—HARA INSTITUT FUR LANDWIRTS CHAFTLICHE. Vol. 5. (1931 —.
15. BIBLIOGRAPHY OF REFERENCES TO LITERATURE ON AGRICULTURE AND ALLIED SUBJECTS. VOL. 2. (1938—).
16. BULLETIN OF MIYAZAKI COLLEGE OF AGRICULTURE AND FORESTRY. (1931 —).
17. BULLETIN OF THE CENTRAL EXPERIMENT STATION (Russia). Vol. 1. (1934 —).
18. BULLETIN OF THE IMPERIAL INSTITUTE, London. Vol. 1. (1903 —).
19. BULLETINUL CULTIVAREI SI FERMANTAREI TITINULUI. (Bulletin de l' Institute Experimental pour la culture et la fermentation du tabac) (Rumania). Vol. 21. (1932 —).
20. CROP REPORTS (NATIONAL AGRICULTURAL RESEARCH BUREAU, CHINA). Vol. 3. (1935 —).
21. CYPRUS AGRICULTURAL JOURNAL. Vol. 25. (1930 —).
22. EAST AFRICAN AGRICULTURAL JOURNAL. (Nairobi). Vol. 1. (1935 —).
23. EMPIRE JOURNAL OF EXPERIMENTAL AGRICULTURE. (England). Vol. 1. (1933 —).
24. EXPERIMENT STATION RECORD. (U. S. Department of Agriculture). Vol. 1—19, 21, 27 and 62. (1930 —).
25. FARMER (Natal). Vol. 23. (1935—).
26. FARMING IN SOUTH AFRICA (Pretoria). Vol. 8 (1933 —).
27. GARDENS BULLETIN (Straits Settlements). Vol. 8. (1934 —).
28. GIORNALE DI RISICOLTURA (Italy). Vol. 20. (1930 —).
29. HILGARDIA (JOURNAL OF AGRICULTURAL SCIENCE.) (Berkley). Vol. 7. (1933 —).
30. HORTICULTURAL ABSTRACTS (I. B. of F. Production). Vol. 1. (1931 —).
31. HYDERABAD FARMER. Vol. 1. (1931 —).
32. INDIAN JOURNAL OF AGRICULTURAL SCIENCE. VOL. 1. (1931 —).
33. INTERNATIONAL REVIEW OF AGRICULTURE. Vol. 23 (1932 —).
34. INTERNATIONAL TEA COMMITTEE BULLETIN.
35. JOURNAL OF AGRICULTURAL RESEARCH. (U. S. A.) Vol. 41. (1930 —).
36. JOURNAL OF AGRICULTURAL SCIENCE. (England). Vol. 1. (1905 —).
37. JOURNAL OF AGRICULTURE OF THE UNIVERSITY OF PUERTO RICO. (Rio Predras,) Vol. 16 and 18. (1934 —).
38. JOURNAL OF THE AMERICAN SOCIETY OF AGRONOMY. (New York). Vol. 21. (1929 —).

39. JOURNAL OF THE DEPARTMENT OF AGRICULTURE. (Victoria). Vol. 34. (1934 —).
40. JOURNAL OF THE IMPERAL AGRICULTURAL RESEARCH STATION, TOKYO. VOL. 2. (1932—).
41. JOURNAL OF THE MINISTRY OF AGRICULTURE. (London). Vol. 6. (1899-1900 —).
42. JOURNAL OF THE RUBBER RESEARCH INSTITUTE. (Malaya). Vol. 1. (1929 —).
43. JOURNAL OF THE SOUTH EASTERN AGRICULTURAL COLLEGE. Wye, Kent. (1907 —).
44. JUTE JOURNAL, Calcutta. VOL. 3. (1938—).
45. KISAN (Patna). Vol. 1. (1933 —).
46. LIGHTER (CANADA, TOBACCO DIVISION), OTTAWA. VOL 1. (1931—).
47. MADRAS AGRICULTURAL JOURNAL. Vol. 19. (1930 —).
48. MALAYAN AGRICULTURAL JOURNAL. Vol. 18. (1930 —).
49. MALAYAN AGRI-HORTICULTURAL ASSOCIATION MAGAZINE. Vol. 3. (1933 —).
50. MELDINGER FRA NORGES LANDBRUKSHOISKOLE. (Norway Scientific Reports from the Agricultural College). VOL. 1. (1910—).
51. MONTHLY BULLETIN OF AGRICULTURAL ECONOMICS AND SOCIOLOGY (International Institute of Agriculture, Rome). Vol. 1. (1910—).
52. MONTHLY BULLETIN OF AGRICULTURAL SCIENCE AND PRACTICE. (International Institute of Agriculture, Rome). Vol. 1. (1910 —).
53. MONTHLY CROP REPORT AND AGRICULTURAL STATISTICS. (International Institute of Agriculture, Rome). Vol. 1. (1910 —).
54. MUID-UL-MUZARIEN. (U. P. DEPTT. OF AGRI., ALLAHABAD). (1935—).
55. NAGHUR AGRICULTURAL COLLEGE MAGAZINE. VOL. 7. (1932—).
56. NEW ZELAND JOURNAL OF AGRICULTURE. VOL. 40. (1930—).
57. PALESTINE GAZETTE. AGRICULTURE SUPPLEMENT. No. 13. (1937—).
58. PHILIPPINE JOURNAL OF AGRICULTURE, MANILA. Vol. 2. (1931 —).
59. PLANNING (P. E. P.), LONDON. No. 76. (1936—).
60. PLANT INDUSTRY IN U. S. S. R. (1934 —).
61. PLANTER, KUALA LUMPUR. [1934 (INCOMPLETE)—].
62. PLANTERS CHRONICLE. (Coonoor, Madras). (1934 —).
63. PLANTERS JOURNAL AND AGRICULTURIST. (Calcutta). (1935 —).
64. PUNJAB FRUIT JOURNAL, LAHORE, Vol. 1. (1937—).
65. QUARTERLY NOTES OF AGRICULTURAL DEPARTMENT, N. W. F. P. VOL. 1. (1939—).
66. RESEACH STUDIES OF THE STATE COLLEGE OF WASHINGTON. VOL. 4. (1936—).
67. REVUE AGRICOLE, Saint Denis. [1934 (Incomplete)—].
68. RHODESIA AGRICULTURAL JOURNAL. (1934 —).
69. SCIENTIFIC REPORTS FROM THE AGRICULTURAL COLLEGE OF NORWAY OSLO. Vol. 11 (1931—).
70. SEASONAL NOTES (Punjab Agricultural Department), Vol. 7. (1930 —).
71. SOVIET SUBTROPICS. LENINGRAD. (1933—).
72. TASMANIAN JOURNAL OF AGRICULTURE. Vol. 1. (1930 —).
73. TEXTES LEGISLATIF (I. I. A., Rome). (1935—).
74. TOBACCO INTELLIGENCE (I. E. C.). (1938—).
75. TRANSACTIONS OF THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND. VOLS. 10, 14. (1903—).
76. TRAVAIL AGRICOLE, Rome. VOL. 1. (1938—).
77. TREUBIA (Dutch East Indies). Vol. 1. (1919 —).
78. TROPICAL AGRICULTURE (Trinidad). Vol. 7. (1930 —).
79. TROPICAL AGRICULTURIST. (Ceylon.) Vol. 41—58, 73. (1929 —).
80. WEST INDIA COMMITTEE CIRCULAR. Vol. 47. (1932 —).
81. WHEAT STUDIES. (U. S. A.) Vol. III—

Animal Husbandry and Dairying.

82. ANGORA GOAT JOURNAL. (Oregon). Vol. 26. (1936 —).
83. ANIMAL BREEDING ABSTRACTS. (Imperial Bureau of Animal Genetics). Vol. 1. (1933 —).
84. AYRSHIRE CATTLE SOCIETY'S JOURNAL. (1934 —).
85. BLOOD STOCK BREEDERS' REVIEW. (England). Vol. 18. (1929 —).
86. DAIRY FARMER. (London). VOL. 9. (1937—).
87. DAIRY NEWS LETTER, CANADA. VOL. 18. (1937—).
88. FARMER AND STOCK BREEDERS. (England). (1931 —).
89. GAZETTE OF THE PHILIPPINE ISLANDS (BUREAU OF ANIMAL INDUSTRY, Manila. VOL. 2. (1932-33—).
90. GOAT WORLD (U. S. A.). Vol. 20. (1935 —).
91. HARPER ADAMS UTILITY POULTRY JOURNAL. Vol. 17. (1931-32 —).
92. HORSE BREEDING. (Delhi). Vol. 9. (1933 —).
93. INDIAN BEE JOURNAL. VOL. 1. (1939—).
94. INDIAN POULTRY GAZETTE. Vol. 21. (1932 —).
95. INDIAN WILD LIFE, Agra. Vol. 3. (1938—).
96. INTERNATIONAL REVIEW OF POULTRY SCIENCE. (Holland). Vol. 4. (1931 —).
97. JOURNAL OF DAIRY RESEARCH. (England). Vol. 1. (1929 —).
98. JOURNAL OF DAIRY SCIENCE. (U. S. A.) Vol. 13. (1930 —).
99. JOURNAL OF THE BRITISH DAIRY FARMER'S ASSOCIATION. Vol. 43. (1931 —).
100. JOURNAL OF THE BRITISH GOAT SOCIETY. Vol. 27. (1934 —).
101. LIST OF REFERENCES FROM CURRENT LITERATURE. (Issued by the National Institute for Research in Dairying, Reading). (1931 —).
102. NUTRITION ABSTRACTS AND REVIEWS. (Imperial Bureau of Animal Nutrition). Vol. 1. (1931 —).
103. ONDERSTEPOORT JOURNAL (Pretoria South Africa,) Vol. I. (1933 —).
104. PHILIPPINE JOURNAL OF ANIMAL HUSBANDRY. (Manila).
105. POULTRY AND POULTRY HUSBANDRY. (England). (1931 —).
106. POULTRY SCIENCE. (U. S. A.). Vol. 1. (1921-23 —).
107. PROBLEMS OF ANIMAL HUSBANDRY. (Moscow). (1932 —).

Biology, Heredity and Genetics.

108. ARCHIVES DO INSTITUTO DE BIOLOGIA VEGITAL, RIO DE JANEIRO. VOL. 2. (1935 —).
109. BIOLOGICAL ABSTRACTS. (U. S. A.). Vol. 1. (1927 —).
110. BIOLOGICAL BULLETIN. (U. S. A.). Vol. 60. (1931 —).
111. BIOLOGICAL REVIEWS. (England). Vol. 7. (1932 —).
112. GENETICS. (U. S. A.). Vol. 15. (1930—).
113. HERBAGE ABSTRACTS. (Imperial Bureau of Plant Genetics). Vol. 1. (1931—).
114. HERBAGE REVIEWS. (Imperial Bureau of Plant Genetics). Vol. 1. 1933—).
115. JOURNAL OF GENETICS. (England). Vol. 21. (1929 —).
116. JOURNAL OF HEREDITY. (U. S. A.) Vol. 21. (1930 —).
117. OBIOLOGICO, CAIXA (Brazil). (1938 —).
118. PLANT BREEDING ABSTRACTS (Imperial Bureau of Plant Genetics). Vol. 1. (1930 —).
119. PROCEEDINGS OF THE SOCIETY OF BIOLOGICAL CHEMISTS. INDIA (HEBBAL).
120. QUARTERLY REVIEW OF BIOLOGY. (U. S. A.). Vol. 5. (1930 —).

Botany and Mycology. (*See also Genetics.*)

121. AMERICAN NATURALIST. (New York). (1936 —).
122. ANNALES DES EPIPHYTES ET DE PHYTOGENETIQUE. (Paris). Vol. 2. (1936 —).
123. ARCHIVES DO INSTITUTO DE BIOLOGICO, (Brazil). Vol. 1. (1928—).

124. Bulletin du Jardin Botanique (Buitenzorg). Vol. 1. (1919—).
125. Bulletin of Applied Botany of Genetics and Plant Breeding. (Lenin Academy of Agricultural Sciences in U. S. S. R. Institute of Plant Industry. 13 series.) (1931 —).
126. Bulletin of Miscellaneous Information. (Kew Gardens). (1888-1889, 1901, 1906-18 and 1931 —).
127. Chronica Botanica. Vol. 1. (1936 —).
128. Die Ernahrung er Pflanze. (Germany). Vol. 27. (1931 —).
129. International Bulletin of Plant Protection. (International Institute of Agriculture, Rome.) Vol. 3. (1929 —).
130. Journal of the Indian Botanical Society. Vol. 1. (1919-20 —).
131. Journal of the National Institute of Agricultural Botany. (England). Vol. 1. (1924 —).
132. Records of the Botanical Survey of India. (Vol. 1—5, 7—8—).
133. Review of Applied Mycology. (England). Vol. 1. (1922—).
134. Revie de Botanique Appliquee. Vol. 17. No. 185. (1936 —).
135. Rodriguesia: Revista du Instituto de Biologia Vegetal. Rio de Janiero. (Brazil). Vol. 1. (1935—).
136. Scientific Horticulture: Journal of the Horticultural Education Association. Wge, Kent, (England). Vol. 1. (1932 —).
137. Tijdschrift over plantenziekten. Wageningen. (1936—).
138. Tropenpflanzer. (Germany). (1930 —).

Chemistry including Agricultural Chemistry, Biochemistry and Soil Science.

139. Annual Report of the Progress of Applied Chemistry. Vol. 1. (1916 —).
140. Annual Review of Biochemistry. Vol. 1. (1932 —).
141. British Chemical Abstracts (Parts A, B & C), London. (1938—).
142. Imperial Bureau of Soil Science. Publications—
    (i) Monthly Letters (1932 —).
    (ii) Publications relating to soils and fertilizers No. 1. (1932 —).
    (iii) Technical Communications. No. 1. (1929 —).
143. Industrial Chemist. (England). (1932 —).
144. Journal of the Chemical Society. (England). (1928 —).
145. Journal of the Indian Chemical Society. Vol. 10. (1933 —).
146. Proceedings of the International Society of Soil Science. Vol. 6. (1931—)
147. Soil Conservation. (Washington). Vol. 1.
148. Soil Research. (International Society of Soil Science). Vol. 1. (1930 —).
149. Soil Science. (U. S. A.). Vol. 1. (1916 —).
150. Soils and fertilizers. Harpenden. Vol. 1 (1938—).

Commerce.

151. Board of Trade Journal. (England). (1932 —).
152. Burma Trade Journal. Vol. 1. (1938 —).
153. Canned and Dried Fruit Notes. London. (1936 —).
154. Capital. (Calcutta). (1931 —).
155. Ceylon Trade Journal. (Colombo). Vol. 1. (1935 —).
156. Commerce. (Calcutta). Vol. 44. (1932 —).
157. Commerce Reports. (U. S. A.). (1930 —).
158. Commercial America. Vol. 129. (1932 —).
159. Commerical Gazette. (Calcutta). (1933 —).
160. Current Quotations of the Bombay Chamber of Comerce (1932 —).

161. Indian Trade Journal. Vols. 1-5, 7-27, 29-47 and 93. (1929 —).
162. Indo-Commercial Gazette. (Austria). (1934 —).
163. Journal of the Indian Merchants Chamber. Vol. 25. (1932 —).
164. Manchester Guardian Commercial Supplement. (1932 —).
165. Monthly Survey of Business Conditions in India. Vol. 1. (1933 —).
166. Oil and Colour Trade Journal. (England). (1933 —).
167. Trade and Engineering Commercial Supplement. (England). (1932 —).
168. Trade at Stations adjacent to Land Frontier Routes. (Delhi). (1934-35 —).
169. Trade Statistics relating to the Maritime States in Kathiawar and the State of Travancore. (Previously called Kathiawar Trade Statistics). (Delhi). (1933 —).
170. Weekly arrivals: Canned fruits—Tomato products—Dried fruits. (London).
171. Weekly Dairy Produce Notes. (London). (1935 —).
172. Weekly Fruit Intelligence Notes. (London). (1935 —).
173. Wool Intelligence Notes. (London). (1935).

Cotton and other Textiles.

174. Boletin meansual (Buenos Aires). No. 22. (1937 —).
175. Boroda Za Klopok (Cotton Fibre). (Russia). (1933 —).
176. Bulletin of the Central Asia Scientific Research Cotton Institute (Russia). No. 1. (1930 —).
177. Empire Cotton Growing Review. (England). Vol. 1. (1924 —).
178. Financial News. (Bombay). (Previously called "Cotton and Finance"). Vol. 7. (1931 —).
179. International Cotton Bulletin. (Manchester). Vol. 7. (1929 —).
180. Journal of the Textile Institute. (Manchester). Vol. 21. (1930 —).
181. Memoirs of Cotton Research Station, Trinidad : Series A. Genetics.
182. Memoirs of Cotton Research Station, Trinidad Series B. Physiology.
183. Monthly Statistics of Cotton Spinning and Weaving in India. (Delhi). (1933 —).
184. Raw Cotton Trade Statistics. (Department of Commercial Intelligence and Statistics, India). (1931-32 —).
185. Summary of Current Literature. (British Cotton Industry Research Association). (England). Vol. 11. (1931 —).

Economics.

186. Bengal Co-operative Journal. Vol. 18. (1932-33 —).
187. Bihar and Orissa Co-operative Journal. Vol. 9. (1931 —).
188. Bulletin Economique de l'Indochine. Vol. 34. (1931 —).
189. Econometrica : Journal of the Economic Society, Colorado (U. S. A.). Vol. 1. (1933 —).
190. Economic History. (A supplement of Economic Journal). (England). Vol. 2. (1931 —).
191. Economic Journal. (England). Vols. 20-22, 24-26 and 40. (1930 —).
192. Economists. (England). September. (1935 —).
193. Government Measures Affecting Agricultural Prices. (International Institute of Agriculture, Rome). Vol. 1. (1935 —).
194. Gramajivan (Rural life). Baroda.
195. Indian Economist. (Calcutta). (1936 —).
196. Indian Finance. (1931 —).

197. INDIAN JOURNAL OF ECONOMICS. (Allahabad). (1936 —).
198. INDUSTRIAL AND LABOUR INFORMATION. (Geneva). Vol. 35. (1936 —).
199. INTERNATIONAL BIBLIOGRAPHY OF AGRICULTURAL ECONOMICS. (INTERNATIONAL INSTITUTE OF AGRICULTURE, ROME). Vol. 1.—
200. IQTASAD JOURNAL. (Economic Journal Afghanistan). (1933—).
201. JOURNAL OF THE INDIAN MERCHANTS CHAMBER. (1932 —).
202. MADRAS JOURNAL OF CO-OPERATION. Vol. 22. (1922 —).
203. REVISTA DE ECONOMIA E ESTATISTICA. RIO DE JANEIRO. Vol. 1. (1936 —).
204. WIRTSCHAFTSDIENST. (Germany). Vol. 20. (1935—).

Entomology.

205. ARBEITEN UBER MORPHOLOGISCHE UND TOXONOMISCHE ENTOMOLOGIE AUS BERLIN-DAHLEM. (Germany). Vol. 1. (1934 —).
206. ARBEITEN UBER PHYSIOLOGISCHE UND ANGEWANDTE ENTOMOLOGIE AUS BERLIN-DAHLEM. (Germany). Vol. 1. (1934 —).
207. BULLETIN OF ENTOMOLOGICAL RESEARCH. (England). Vol. 1. (1910 —).
208. ENTOMOLOGISCHE BEIHEFTE AUS BERLIN-DAHLEM. (Germany). (1934 —).
209. REVIEW OF APPLIED ENTOMOLOGY: Series "A" (Agriculture). (England). Vol. 19. (1931 —).
210. REVIEW OF APPLIED ENTOMOLOGY : Series "B" (Veterinary). (England). Vol. 19. (1931 —).

Forestry.

211. INDIAN FOREST RECORDS. Vol. 2. (1910 —).
212. INDIAN FORESTER. Vols. 1-14, 32—33, 35-43, 49, 52, 54. (1928 —).

General.

213. BULLETIN OF THE AMERICAN LIBRARY ASSOCIATION. Vol. 26. (1932 —).
214. BULLETIN OF THE COLONIAL INSTITUTE OF AMSTERDAM. Vol. 1. (1237 —).
215. BULLETIN OF THE IMPERIAL INSTITUTE, LONDON. Vol. 1. (1903 —).
216. BULLETIN OF THE NEW YORK PUBLIC LIBRARY. Vol. 38. (1934 —).
217. BULLETIN OF THE PAN-AMERICAN UNION. (U. S. A.) Vol. 66. (1932 —).
218. CANADIAN JOURNAL OF RESEARCH (Ottawa). (1935 —).
219. EMPIER PRODUCER, London. (1934 —).
220. INDEX TO THE LITERATURE OF FOOD INVESTIGATIONS. (London). Vol. 1. (1929 —).
221. INDIAN CONCRETE JOURNAL. Vol. 5. (1931 —).
222. INDIAN INFORMATION SERIES. VOL. 1. (1937 —).
223. INDIAN REVIEW. Vol. 30. (1929 —).
224. INDIAN ROADS. (I. & L. Department). (1931 —).
225. JOURNAL AND PROCEEDINGS OF THE ASIATIC SOCIETY OF BENGAL. (Calcutta). Vol. 1. (1905 —).
226. JOURNAL OF THE ANNAMALAI UNIVERSITY. Vol. 4. (1935 —).
227. JOURNAL OF THE COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH. (Australia) Vol. 1. (1927 —).
228. JOURNAL OF THE INSTITUTE OF BREWING. (England). Vol. 33. (1927 —).
229. JOURNAL OF THE MADRAS UNIVERSITY. Vol. 1. (1928 —).
230. JOURNAL OF THE ROYAL SOCIETY OF ARTS. (England). (MAY 1935 —).
231. K-H NEWS LETTERS (London). No. 74. (1937 —).

232. LANDHOLDERS' JOURNAL (Calcutta). Vol. 4. (1936 —).

233. MODERN REVIEW. (Calcutta). August. (1935 —).

234. NEW ZEALAND JOURNAL OF SCIENCE AND TECHNOLOGY. Vol. 10. (1923 —).

235. SPECTATOR (England). April. (1936 —).

236. SUMMARY OF CURRENT LITERATURE. (Department of Scientific and Industrial Research). (England). Vol. 3. (1930 —).

237. UNITED EMPIRE. (England). Vol. 22. (1931 —).

League of Nations.

238. MONTHLY SUMMARY OF INTERNATIONAL LABOUR ORGANIZATION. (Geneva).

239. MONTHLY SUMMARY OF THE LEAGUE OF NATIONS. Vols. 1-9 and 11.

240. MONTHLY SUMMARY OF STATISTICS. (See under "Statistics").

241. OFFICIAL JOURNAL OF THE LEAGUE OF NATIONS. (1920 —).

242. QUARTERLY BULLETIN OF HEALTH ORGANIZATION. (Geneva). Vol. 2. (1933 —).

243. QUARTERLY BULLETIN OF INFORMATION ON THE WORK OF INTERNATIONAL ORGANIZATIONS. (Geneva). Vol. 3. (1931 —).

244. RECORDS OF THE ASSEMBLY OF THE LEAGUE OF NATIONS. (Geneva). (1920 —).

Medicine.

245. BULLETIN OF HYGIENE. (England). Vol. 6. (1931 —).

246. INDIAN JOURNAL OF MEDICAL RESEARCH. (Calcutta). Vol. 19. (1931 —).

247. INDIAN MEDICAL GAZETTE. (1935 —).

248. INDIAN MEDICAL JOURNAL (Madras). (1937—.)

249. INDIAN MEDICAL RESEARCH MEMOIRS. (Calcutta). No. 22. (1932 —).

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268. RECORDS OF THE GEOLOGICAL SURVEY OF INDIA. Vol. 62. (1929 —).

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283. JOURNAL OF THE ROYAL STATISTICAL SOCIETY. (London). Vol. 92. (1929 —).

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297. ANNALES DE l'INSTITUTE PASTEUR. (France). Vol. 46. (1931 —).

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303. BULLETIN DE L'INSTITUTE PASTEUR. (France). Vol. 29. (1931 —).

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306. INDIAN JOURNAL OF VETERINARY SCIENCE AND ANIMAL HUSBANDRY. Vol. 1. (1931 —).

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308. Journal of the American Veterinary Medical Association. Vol. 29. (1930 —).
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313. Medicine Veterinary Sovietique (U. S. S. R.). (1936 —).
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316. Punjab Veterinary Journal. (1934 —).
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324. Helminthological Abstracts. (London). (1932 —).
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326. Journal of Parasitology. (U. S. A.). Vol. 17. (1930 —).
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328. Proceedings of the Helminthological Society of Washington. Vol. 1. (1934 —).
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APPENDIX X.

List of Scientific and Technical Officers paid from the research grant of the Imperial Council of Agricultural Research as on 31st March 1939.

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
Imperial Institute of Sugar Technology.					
1. Bureau of Sugar Standards .	Chemist	Mr. N. C. Verma, B.Sc. A.H.B.T.I.	11th March 1935	By selection.	
2. Cattle Feed Scheme . .	Assistant Chemist . .	Mr. M. A. Ekambram, B.Sc. A. H. B. T. I.	...	.....	
3. Sugar Research and Testing Station (Bilari).	Chemist	Mr. K. C. Joshi, B.Sc. Dip. Tech.	...	.....	
Locust Research Scheme, I. C. A. R.	Locust Research Entomologist to the Imperial Council of Agricultural Research, Karachi.	Rao Bahadur Y. Ramchandra Rao, M.A., F.R.E.S.	13th December 1930.	On foreign service, lent by the Madras Agricultural Department.	Transferred to New Delhi from 10th February 1939.
	Assistant Entomologist, Pasni.	Dr. M. L. Roonwal, Ph.D. .	6th November 1935.	Direct appointment . .	Transferred to Karachi, 16th May 1938. Resigned 28th January 1939.
	Assistant Entomologist, Karachi.	Dr. S. Mukerji, D.Sc. . .	10th January 1936.	Direct appointment . .	Placed in charge of work at Karachi, 9th February 1939.
	Locust Research Assistant, Barmer.	Mr. Des Raj Bhatia, M.Sc. .	2nd January 1931.	Through the Public Service Commission (India).	
	Locust Research Assistant, Pasni.	Mr. S. M. Taqi Ahsan, M.Sc.	28th March 1934	Direct appointment..	
	Locust Research Assistant, Ambagh.	Mr. R. N. Batra, M.Sc. . .	27th May 1935 .	Direct appointment.	
	Mekran Survey Assistant, Pasni.	Mr. Rashid Ahmed, B.Sc. Hons.	23rd August 1935	Direct appointment.	
	Biometrical Assistant, Karachi.	Mr. Ram Lal Gupta, M.Sc. .	10th October 1936	Direct appointment . .	Transferred to New Delhi, 10th February 1939.
Statistical—Field Experiment .	Statistician . . .	Rao Bahadur M. Vaidyanathan, M.A. L.T.	6th July 1930 .	Through the Public Service Commission (India).	
	Statistical Assistant . .	Mr. S. Subramania Iyer, M.A.	5th June 1933 .	Through the Public Service Commission (India).	
	Agricultural Assistant .	Mr. T. Krishna Murthy, B.Sc. (Ag.).	11th February 1935.	Through the Public Service Commission (India).	
Animal Husbanding Bureau .	Technical Assistant . .	Mr. K. P. R. Kartha, B.A. .	..	Direct appointment . .	
IMPERIAL AGRICULTURAL RESEARCH INSTITUTE, NEW DELHI.					
1, Botanical Sub-Station, Pusa	1. Superintendent . .	Mr. R. D. Bose, B.Sc.. .	15th May 1936. .	By transfer from the Botanical section of the Institute.	
	2. Assistant . . .	Mr. S. Sen, M.Sc., Assoc. I.A.R.I.	23rd March 1939 .	By selection from P. G. Students of the Institute.	

2. Sugarcane Sub-Station, Karnal.	1. Superintendent . .	Mr. G. V. James . .	16th April 1931 .	By promotion from the Department.
	2. Technical Assistant .	Mr. T. R. Venkatraman, B.A.	2nd October 1936	By promotion from the Department.
3. Scheme for research on Mosaic and other diseases of sugarcane.	1. Plant Pathologist .	Dr. B. L. Chona, M.Sc., Ph.D.	23rd March 1936	Through the Federal Public Service Commission.
	2. Assistant Sugarcane Mycologist.	Mr. L. S. Subramaniam .	23rd June 1933 .	Through the Federal Public Service Commission.
	3. Research Assistant .	Mr. S. A. Rafay, M.Sc. .	17th October 1932.	Through the Federal Public Service Commission.
4. Scheme for research on Genetics of Sugarcane at the Imperial Cane Breeding Station, Coimbatore.	1. Geneticist . . .	E. K. Janaki Ammal, M.A., M.Sc., D.Sc.	26th May 1934 .	Through the Federal Public Service Commission.
5. Scheme for Potato breeding in Northern India.	1. Superintendent . .	Mr. Pushkarnath, M.Sc., Assoc. I.A.R.I.	1st April 1935 .	By selection from P. G. Students of the Institute.
	2. Assistant . . .	Mr. M. L. Khanna, B.Sc. .	1st August 1936 .	By selection from the list of candidates recommended by Principals of Agricultural Colleges.
6. Scheme for Wheat Rust Research, Simla.	1. Assistant . . .	Mr. S. Z. Hasnain, M.Sc., Assoc. I.A.R.I.	17th December 1937.	Selected from applications received for the post which had been advertised.
	2. Junior Assistant . .	Mr. S. D. Misra, M.Sc., Assoc. I.A.R.I.	15th November 1938.	Selected from applications received for the post which had been advertised.
7. Tobacco Research Substation, Guntur.	1. Superintendent . .	Mr. T. Narayana Rao, M.A., Assoc. I. A. R. I.	23rd March 1938	By transfer from the Madras Agri. Department.
	2. Assistant Entomologist	Mr. C. K. Samuel, B.Sc.	10th August 1936	By transfer from the Entomological Section of the Institute after inviting applications by advertisement.
8. Scheme for Research on Insect Pests of Sugarcane.	1. Biological Control Res. Officer.	Dr. J. A. Muliyil, B.A., Ph.D.	26th April 1938 .	Through Federal Public Service Commission.
	2. Assistant . . .	Mr. T. V. Venkatraman, M.Sc.	27th August 1936	Selected from applications received for the post which had been advertised.
	3. Assistant . . .	Mr. K. V. Rao, B.Sc., Assoc. I.A.R.I.	4th September 1936.	Selected from applications received for the posts which had been advertised.
	4. Assistant . . .	Mr. Tazimul Haq, B.Sc., (Agri.).	5th March 1938 .	Selected from applications received for the posts which had been advertised.
	5. Assistant . . .	Mr. K. Lakshmanan, B.Sc. (Agri.).	1st March 1937 .	Selected from applications received for the post which had been advertised.
	6. Assistant . . .	Mr. Prabhakar Rao, M.Sc. .	1st September 1938.	Selected from applications received for the posts which had been advertised.
9. Scheme for Research on Chemistry of Sugarcane.	1. Assistant Sugarcane Chemist.	Mr. S. C. Chaudhuri, M. Sc.	7th March 1938 .	Through Federal Public Service Commission.
	2. Assistant . . .	Mr. K. V. S. Satyanarayana, B.Sc. (Ag.) Assoc. I.A.R.I.	1st April 1938 .	By selection from P. G. students of the Institute.

Name of Scheme	Name of post.	Name of officer and qualifications	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
IMPERIAL VETERINARY RESEARCH INSTITUTE, MUKTESAR.					
1. Protozoological scheme .	Systematic Protozoologist	Dr. H. N. Ray, M.Sc. (Cal.), Ph. D. (Lond.).	18th August 1936	Recruited through the Public Service Commission.	
2. Warble Fly scheme . .	(*i*) Entomological Assistant.	Mr. B. N. Soni, B.Sc., (Punjab) and B.Sc., (Agri.) (Edin.)	1st January 1937	Recruited by the Director, Imperial Veterinary Research Institute.	
	(*ii*) Veterinary Inspector	Mr. Mustaq Ahmed Khan, G.C.V.C.	21st January 1939	Recruited by the Director, Imperial Veterinary Research Institute.	
3. Investigation of Tuberculosis and John's disease among animals.	Veterinary Bacteriologist .	Mr. Lakshmi Sahai . .	..	Recruited by the Government of India.	At present undergoing trainining in England.
4. Research into the diseases of Poultry.	Research Officer . .	Mr. S. Ganapaty Iyer .	..	Recruited through the Federal Public Service Commission.	Proceeded to England on the 10th February 1939 for training.
MADRAS.					
1. Research on Potatoes in the Madras Presidency.	Superintendent, Agl. Research Station, Nanjanad.	Mr. V. K. Subramanaia Mudaliar, L.Ag.	13th June 1933 .	Promoted from Madras Agricultural Subordinate Service Class I—Upper Subordinates.	
2. (*a*) Sugarcane Research at Anakapalle.	Farm Manager . .	Sri N. Lakshmi Kantam, B.Sc., Ag.	16th May 1938 .	Transferred from the Department.	
	Botany Assistant .	Sri P. Sitaramayya, B.Sc. Ag.	7th April 1937 .	Transferred from the Department.	
(*b*) Sugarcane Research, Gudiyattam.	Farm Manager . .	Sri P. S. H. Narayanaswami Nayudu, B.Sc. Ag.	30th July 1937 .	Transferred from the Department.	
	Botany Assistant . .	Sri S. Ramaswami Ayyar, B.Sc. Ag.	11th May 1933 .	Transferred from the Department.	
	Farm Manager . .	Sri C. Ekambaram, B.Sc. Ag., underwent training in Animal Husbandry and Dairying at Pusa.	16th June 1935 .	Transferred from the Department.	
3. Dry Farming Scheme, Hagari	Superintendent, Dry Farming Station, Hagari.	Sri C. Vijayaraghava Acharya, L.Ag.	14th April 1934 .	Transferred from the Department.	
	Assistant in Plant Physiology.	Sri V. Panduranga Rao, M.A. (Botany and Zoology), M.Sc. (Nebraska).	1st October 1935	Through the Public Service Commission, Madras.	Was given special training in plant physiology at the cost of the I.C.A.R.
	Assistants for Millets .	Sri P. Seshadri Sarma, B.Sc. Ag.	7th May 1934 .	Transferred from the Department.	

		Sri P. Krishnaswami, B.Sc. Ag.	31st October 1936	Transferred from the Depart.
	Assistants to Soil Physicist	A. Abdul Samad, Sahib B.A. (Physics and Chemistry), B.Sc. Ag.	7th May 1934 .	Transferred from the Department.
4. Fruit Research Station, Anantarajupet.	Superintendent . .	Sri K. C. Naik, B.Ag. (Bombay), M.Sc. (Bristol).	3rd Aug. 1935 .	Through the Public Service Commission.
	Farm Manager . .	Sri M. Jivan Rao, B.Sc. Ag.	September 1937 .	Transferred from the Department.
5. Marketing Scheme . .	Assistant Marketing Officers	Sri S. N. Venkataramana Ayyar, B.A. (Physics and Chemistry), B.Sc. Ag., underwent Statistical training at Calcutta.	21st February 1935.	Transferred from the Department.
		Sri K. W. Chakrapani Marar, L. Ag.	25th February 1935.	Transferred from the Department.
		Sri M. P. Kunhikutty, L.Ag., underwent post-graduate course in Animal Husbandry and Dairying at Bangalore.	23rd February 1935.	Transferred from the Department.
✓ 6. Animal Nutrition Scheme	Assistants . . .	Sri Y. V. Narayana Ayyar, B.A. B.Sc. Ag.	19th June 1935 .	Transferred from the Department.
		Sri S. Varadarajan, B.Sc., Ag.	19th June 1935 .	Transferred from the Department.
		Sri K. M. Krishna Menon, B.Sc. Ag.	19th June 1935 .	Transferred from the Department.
		Sri C. Balasubrahmanyam, B.A., B.Sc. Ag.	16th September 1935.	Transferred from the Department.
7. Groundnut Research Scheme	Superintendent, Agricultural Research Station, Tindivanam.	Sri C. R. Seshadri, B.A., B. Sc. Ag.	5th February 1939.	Transferred from the Department.
	Assistant . . .	Sri M. Bhavani Shankar Rao, B.Sc. Ag.	22nd January 1937.	Transferred from the Department.
	Assistant . . .	Sri M. M. Krishna Marar, B.Sc. Ag.	February 1931 .	Transferred from the Department.
8. Coconut Research Scheme .	Superintendent, Agricultural Research Station, Kasaragod.	Sri G. Venkatanarayana, B. Sc. Ag.	15th September 1938.	Transferred from the Department.
	Botanical Assistant .	Mr. S. D. S. Albuquerque, B.Sc., Ag.	15th September 1938.	Transferred from the Department.
	Botanical Assistant .	P. M. Sayeed Sahib, B. Sc. Ag.	26th September 1938.	Transferred from the Department.
	Chemical Assistant .	Sri C. T. Ittyachan, B. Sc. Ag.	15th September 1938.	Transferred from the Department.
9. Scheme for Extension of Work on Insect Pests of Sugarcane.	Assistant in Entomology .	Mr. P. Israel, M. A. (Zoology Main and Botany Subsidiary).	25th March 1939	Transferred from the Department.
		Sri K. Brahmachari, M. A. (Zoology and Botany).	9th March 1939 .	Transferred from the Department.

Name of Scheme	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
MADRAS—*contd.*					
10. Veterinary Diseases Investigation Scheme.	Veterinary Investigation Officer, Madras.	Sri G. R. Viswanathan Graduate, Madras Veterinary College: Post Graduate course, Mukteswar: Post-Graduate training in the United Kingdom.	13th April 1933 .	Transferred from the Department.	
11. Veterinary Diseases Investigation Scheme.	Assistant to the Veterinary Investigation Officer, Madras.	Sri M. Ramakrishnan, Graduate, Madras Veterinary College.	22nd November 1935.	Transferred from the Department.	
12. Madras Sheep-breeding scheme.	Farm Manager . .	Sri P. K. Krishnan Nambiar, Certificate of proficiency in Agriculture.	23rd October 1938.	Transferred from the Madras Agricultural Department.	
BOMBAY.					
1. Investigation of diseases in livestock and their treatment.	Veterinary Investigation Officer, Bombay.	Mr. R. N. Naik, G.B.V.C. .	27th June 1932 .	Recruited through the Public Service Commission (India).	
2. Scheme for the Control of Ticks.	Incharge cattle dipping tank Tinkewadi, District Belgaum.	Mr. E. R. Kulkarni, G.B.V.C.	28th January 1939.	Part time in addition to his own duties.	
	Incharge spraying operation, Kumbhari District Sholapur.	Mr. V. S. Deo G.B.V.C. .	26th March 1939	Seconded from the Civil Veterinary Department.	
3. Sugarcane Research Scheme for the Deccan, Padegaon.	Principal Agricultural Officer.	Mr. V. V. Gadgil, B.Ag. .	24th November 1938.	Deputed from the Bombay Agricultural Department.	
	Crop Physiologist . .	Dr. R. D. Rege, M.Sc. (Bom.), Ph.D. (London).	6th July 1932 .	Recruited through the Board of Selection appointed by the Government of Bombay.	
	Soil Physicist . . .	Dr. J. K. Basu, M.Sc. (Cal.), Ph. D. (Lond).	18th June 1932 .	Recruited through the Board of Selection appointed by the Government of Bombay.	
	Agricultural Overseers .	Mr. V. N. Apte, B.Ag. (Bom.)	18th December 1931.	Deputed from the Bombay Agricultural Department.	
		Mr. N. B. Patwardhan, B.Ag. (Bom.).	1st March 1932 .	Deputed from the Bombay Agricultural Department.	
		Mr. P. S. Kulkarni, B.Ag. (Bom.).	15th October 1932.	Deputed from the Bombay Agricultural Department.	
		Mr. P. B. Wagle, M.Ag. (Bom.).	1st March 1932 .	Deputed from the Bombay Agricultural Department.	
		Mr. S. K. Sannabhadti, B.Ag. (Bom.).	1st September 1935.	Deputed from the Bombay Agricultural Department.	

		Mr. S. S. Sirur, B.Ag.(Bom.).	5th August 1932.	Transferred from the scheme financed from the funds of the Indian Central Cotton Committee.
		Mr. V. D. Tagare, B.Ag. (Bom.), B.Sc. (Bom.).	13th August 1932	Recruited by the Director of Agriculture, Bombay Presidency.
4. Dry Farming Research Scheme.	Chief Investigator, Dry Farming Research Scheme, Sholapur.	Mr. N. V. Kanitkar, M.Ag., B.Sc.	1st October 1933	Deputed from the Bombay Agricultural Department.
Main-centre, Sholapur .	Assistant Investigator, Dry Farming Research Scheme in charge of Soil Section.	Dr. V. N. Gokhale . .	23rd December 1936.	Deputed from the Bombay Agricultural Department.
	Senior Assistant in Charge of Plant Section.	Mr. R. B. Gode, M.Sc.	18th October 1933	Transferred from the scheme financed from the funds of the Indian Central Cotton Committee.
	Superintendent, Dry Farming Research Scheme, Main-centre.	Mr. G. M. Bapat, M.Ag. .	1st October 1933	Deputed from the Bombay Agricultural Department.
	Senior Assistant in Plant Section.	Mr. D. H. Gokhale, M.Ag.	12th October 1933	Recruited by the Director of Agriculture, Bombay Presidency.
	Junior Assistant in Soil Section.	Mr. Y. S. Rane, B. Ag.	1st October 1933.	Recruited by the Director of Agriculture, Bombay Presidency.
Sub-centre, Bijapur . .	Superintendent, Dry Farming Research Scheme, Sub-centre, Bijapur.	Mr. K. D. Gomaste, B. Ag. .	Do. .	Deputed from the Bombay Agricultural Department.
	Junior Assistant at Bijapur.	Mr. G. B. Badami, B.Ag. .	2nd October 1933.	Recruited by the Director of Agriculture, Bombay Presidency.
5. The Cold Storage Research Scheme.	Senior Research Assistant .	Dr. D. V. Karmarkar, M.Sc. (Bom.), Ph.D. (Bristol), A.I.I.Sc.	1st March 1934 .	Recruited by the Director of Agriculture, Bombay Presidency.
	Junior Research Assistant.	Mr. B. M. Joshi, M.Sc. . .	1st March 1934 .	Deputed from the Bombay Agricultural Department.
	Senior Mechanic . .	Mr. K. S. Kahlon . .	1st October 1937.	Promoted by the Director of Agriculture, Bombay Presidency, from the Junior Mechanic in the Scheme.
6. Scheme for improvement of marketing in India.	Assistant Marketing Officers	Mr. A. K. B. Kazi, B.Ag., B.Sc., (Edin), N.D.D., D.I.C.	1st September 1937.	Deputed from the Bombay Agricultural Department.
		Mr. N. V. Bhagawt B.Ag. .	5th April 1935 .	Ditto.
		Mr. B. H. Patil, B.Ag. .	8th July 1935 .	Ditto
		Mr. B. P. Deshpande, M.Ag. .	5th April 1935 .	Ditto.

	Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
	BOMBAY—*contd.*					
✓	7. Sheep breeding Scheme .	Manager . . .	Mr. S. S. Khot, B.Ag.. .	1st November 1937	Deputed from the Bombay Agricultural Department.	
	8. Scheme of investigation into the Striga attack on jowar.	Striga investigator . .	Mr. S. Solomon, B.Ag. (Bom.) M.Sc. (Bom.).	27th January 1939.	Recruited by the Government of Bombay after advertising through the Federal Public Service Commission.	
	9. Virus Diseases Scheme .	Assistant Plant Pathologist.	Dr. M. C. Desai, B.Ag. (Bom.) Ph.D.	1st April 1939 .		
		Assistant Entomologist .	Mr. P. M. Verma, M.Sc. .	1st June 1939 .		
	BENGAL.					
	1. Rice Research Scheme . .	Rice Research Officers .	Babu Suresh Chandra Chakravarty, B.Sc., I.Ag.	1st June 1932 .	Promoted from the Department.	
			Babu Kshitish Chandra Banerjee, B.A., L.Ag.	1st June 1932 .	Promoted from the Department.	
		Assistants . . .	Babu Jnan Ranjan Pal, B.Ag.	1st June 1932 .	Recruited by the Department.	
			Babu Ajit Kumar Chakravarty, M.Sc.	November 1938.	Recruited by the Department.	
✓	2. Animal Nutrition Scheme .	Physiological Chemist .	Babu Indu Bhusan Chatterjee, L.Ag.	2nd January 1932.	Promoted from the Department.	
		Assistant Chemist . .	Mr. Md. Abdul Hai, M.Sc. .	2nd January 1932.	Recruited by the Department.	
	3. Scheme for Physical and Chemical Research into soils.	Physical Assistant . .	Babu Manindra Nath Chakladar, M.Sc.	1st June 1932 .	Recruited through Public Service Commission (India).	
	4. Scheme for establishing sugarcane seedling testing station in Bengal.	Field Assistant . .	Babu Surendra Nath Bhattacharjee.	22nd July 1935 .	Promoted from the Department.	
✓	5. Horticultural Scheme in Bengal.	Horticultural Officer .	Mr. V. N. Vadhawkar, B.Ag.	9th April 1934 .	Recruited through the Public Service Commission (India).	
	6. Scheme for Appointment of marketing staff in Bengal.	Senior Marketing Officer .	Mr. A. R. Malik, M.A., B.Sc. (Edin.)	7th February 1935	Promoted from the Department.	
		Assistant Marketing Officers:	Babu Hiron Kumar Basak, L.Ag.	25th July 1935 .	Promoted from the Department.	
			Babu Kshitish Chandra Guha, B.Sc. (Edin.)	5th August 1935 .	Promoted from the Department.	
			Babu Bhabesh Ch. Roy, L.Ag.	April 1936 .	Promoted from the Department.	
			Moulvi Abdul Wahab Mollah, L.Ag.	20th July 1935 .	Promoted from the Department.	
	7. Scheme for the Appointment of a Veterinary Investigation Officer in Bengal.	Veterinary Investigation Officer.	Mr. B. Singh, G.B.V.C. .	15th July 1936 .	Recruited by the Government of India, Department of Education, Health and Lands from the staff of the Imperial Veterinary Research Institute, Muktesar.	

8 Scheme for systematic cultivation of medicinal plants and study of food poisons.	Botanist	Mr. R. L. Badhwar, M.Sc. .	13th April 1935 .	Recruited by the Department.
	Experimental Assistant .	Dr. N. N. Das, M.Sc., M.B. .	13th April 1935 .	Recruited by the Department.
	Chemist.	Mr. P. C. Khanna, M.Sc. .	5th October 1937	Recruited by the Department.
	Compilers.	Mr. N. C. Goswami, M.Sc. .	1st October 1937	Recruited by the Department.
		Mr. Shamlal Nayar, M.Sc. .	13th December 1937.	Recruited by the Department.
9 Linseed Scheme . . .	Analytical Chemist . .	Dr. Sunil Behari Sen Gupta, M.Sc.	1st October 1937 .	Recruited by the Department.
10. Sugarcane Insect Pest .	Assistants . . .	Mr. M. Qurashi, B.Ag. .	1st February 1939	Recruited by the Department.
		Mr. Abdul Hakim Bhuya, M.Sc.	1st February 1939	Recruited by the Department.
UNITED PROVINCES.				
1. Rice Research Scheme at Nagina.	Assistant Paddy Specialist.	Mr. T. R. Mehta, B.Sc. (Pusa trained).	1st March 1932 .	Promoted . . . .
	Farm Superintendent .	B. Sanjai Singh (2 year course Agri. College).	1st March 1935 .	Promoted from the Department.
	Research Assistants . .	Mr. P. S. Gupta, M.Sc. .	13th August 1935	Direct appointment . .
		Mr. R. K. Tandon, B.Sc., M.Sc.	3rd August 1936 .	Direct Appointment. . .
2. Research into the development of the fruit Industry in the hills in U. P.	Soil Chemist . . .	Mr. Narendra Kumar Das, M.Sc., Asso. I. A. R.I.	17th February 1938.	Recruited through the Federal Public Service Commission.
	Horticulturist . . .	Mr. R. S. Singh, B.Sc. (Reading), L.Ag.	10th July 1934	Recruited through the Federal Public Service Commission.
	Mycologist . . .	Mr. Udai Bhan Singh, M.Sc. .	10th July 1934	
	Entomologist . . .	Mr. Ram Narain Singh, L.Ag.	10th July 1934	
	Assistant Horticulturist .	Mr. G. D. Bhat, B.Ag. .	10th July 1934 .	Direct appointment.
3. Investigation into the problem of the sugar industry in U. P	Cane Physiologist . .	Dr. R. N. Mathur, M.Sc., Ph.D. (Agri.)	15th January 1934.	Direct appointment.
	Cane Agronomist . .	Mr. Imdad Ali Khan, B.Sc. (Agri.) (Punjab).	14th Dec. 1934	Recruited through the Federal Public Service Commission.
	Research Assistants . .	Mr. Iqbaluddin Hyder, B.Sc. (Bristol), Ag.	27th July 1935	Direct appointment.
		Mr. D. C. Agarwal, L.Ag. (post-graduate, Pusa).	15th January 1934.	Promoted from the Department.
	Research Assistant Entomologist.	Mr. B. D. Gupta, M.Sc. .	15th January 1934	Direct appointment.

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through the Public Service, Commission, etc.	Remarks.
UNITED PROVINCES—*contd.*					
4. U. P. Marketing Scheme .	Assistant Marketing Officers	Mr. P. L. Gaur, B.Sc. . .	13th June 1935 .	Recruited through the Federal Public Service Commission.	
		Mr. Shri Ram Singh . .	1st June 1935 .	Ditto.	
		Mr. Pati Ram Kala . .	5th June 1935 .	Ditto.	
5. Cattle Feeding Scheme .	Research Officer . .	Mr. N. C. Dass Gupta . .	11th April 1938 .	Recruited through the Federal Public Service Commission.	
	Research Assistants . .	Dr. Sudhir Kumar Mukerji, M.Sc., D. Phill.	10th Dec. 1938 .	Recruited through the Public Service Commission.	
		Dr. Radha Raman Agarwal, M.Sc., D.Phill.	15th Dec. 1938 .	Ditto.	
	Farm Assistant . .	Mr. Gyan Sarup Datta, B.Sc., A. H. B. T. I., F. I. I. S. T.	12th Dec. 1938 .	Ditto.	
6. Insect Pest Scheme . .	Entomological Assistants .	Mr. Ram Lal Garg, B.Sc., & post-graduate.	1st January 1939.	Ditto.	
		Dr. Shyam Sunder Lal Pardhan, M.Sc., D.Sc.	1st January 1939.	Ditto.	
		Mr. Zahid Ali Siddiqui, M.Sc.	1st January 1939.	Ditto.	
		S. Wahid Hasan Zaidi . .	1st January 1939.	Ditto.	
7. Sugarcane ratooning Scheme.	Assistant cane Agronomist.	Mr. Guru Prashad Kapoor, B.Sc., M.Sc.	1st January 1939.		
8. Milk Recording Scheme .	Milk Recorder. .	Mr. M. J. Zachariah . .	27th January 1939.	Direct appointment.	
PUNJAB.					
1. Sugarcane Research Scheme.	Sugarcane Specialist .	S. Harbans Sing, B.Sc. (Agri.) (Punjab).	11th November 1934.	Promoted from the Department on the recommendations of the Public Service Commission.	
	Agricultural Assistants, A. Class.	Ch. Khushi Muhammad B.Sc. (Agri.)	13th December 1934.		
		Bh. Atom Singh Kochhar, B.Sc. (Agri.)	1st February 1934.		
		Bh. Balbir Singh, B.Sc. (Agri.)	1st February 1934.		

	Agricultural Assistants, A. Class.	Bh. Sardul Singh, B.Sc. (Agri.)	1st February 1934	Appointed by Director of Agriculture, Punjab, who is competent to make the appointment.
		Bh. Hardial Singh Guram, B.Sc. (Agri.)	21st August 1934	
2. Locust Research Scheme .	Agricultural Assistants, A. Class.	Mr. C. B. Mathur, M.Sc. (Zoology), Lucknow University.	2nd January 1931.	
		M. Abdul Haq, B.Sc., (Agri).	9th August 1933.	
3. Fruit and Vegetable Preservation Scheme.	Assistant Fruit Biochemist.	Dr. Girdhari Lal, B.Sc. (Pb.), Ph.D., D.I.C. (London).	8th November 1936.	Promoted from the Department by the Punjab Government.
	Junior Research Assistant	M. Mohammad Ishaq, B.Sc. (Agri.)	23rd April 1937 .	Appointed by Director of Agriculture, Punjab, who is competent tomake the appointment.
4. Scheme for Improvement of Marketing in India.	Assistant Marketing Officer (Fruit).	S. Pritam Singh Diol, M.Sc. (Agri.) Mich. (U. S. A.).	15th March 1935 .	Promoted from the Department by the Punjab Government.
	Assistant Marketing Officer (Livestock).	L. Harjas Rai, L.V.P. (Punjab).	15th March 1935 .	
	Assistant Marketing Officer (Oilseeds).	Ch. Zafar Alam, B.Sc. Agri. (Punjab) M.Sc. (London), F.L.S.	11th August 1935 .	
	Agricultural Assistant, A. Class.	Bh. Partap Singh, B.Sc. (Agri.).	10th May 1937	Appointed by Director of Agriculture, Punjab who is competent to make the appointment.
5. Dry Farming Research Scheme.	Agriculturist . .	L. Tehl Ram . . .	1st July 1935 .	Promoted from the Department by the Punjab Government.
	Soil Physicist . . .	L. Sukh Dayal, M.Sc. (Pb.). .	1st July 1935 .	Promoted from the Department on the recommendations of the Public Service Commission.
	Plant Physiologist . .	Mr. I. M. Rao, M.A., M.Sc. (Madras).	14th March 1936.	Recruited through the Federal Public Service Commission (India).
	Agricultural Assistants, A. Class.	M. Mohammad Afzal, B.Sc. (Agri.)	1st July 1935 .	Appointed by Director of Agriculture, Punjab, who is competent to make the appointment.
		L. Girdhari Lal . . .	1st July 1935 .	
		L. Lekh Raj Dhingra .	1st December 1937.	

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
PUNJAB—*contd.*					
6. Citrus Stock Scheme . .	Assistant Horticulturist .	Dr. Sham Singh, B.Sc. (Agri.) (Pb.), Ph.D. (Bristol).	11th November 1936.	Promoted from the Department by the Punjab Government.	
	Agricultural Assistants, A Class.	Mr. B. S. Mahangar, M.Sc.	18th August 1936		
		Bh. Dayal Singh Johar, M.Sc.	1st October 1936		
7. Oilseeds Research Scheme .	Agricultural Assistants, A. Class.	M. Sultan Ahmed, B.Sc. (Agri.).	1st November 1936.		
		L. Narsingh Dass, B.Sc. (Agri.)	16th August 1937		
		Ch. Jai Lal, B.Sc. (Agri.) .	28th June 1938.	Appointed by Director of Agriculture, Punjab, who is competent to make the appointment.	
8. San Jose Scale Scheme .	Agricultural Assistants, A. Class.	L. Asa Nand B.Sc. (Agri). .	3rd April 1937		
		M. Atiqur Rahman, M.Sc. (Agri.).	1st April 1937 .		
		Bh. Harbans Singh, B.Sc. (Agri.).	5th April 1937 .		
9. Cold Storage Scheme . .	Agricultural Assistant, A. Class.	M. Abdul Hamid Khan, M.Sc.	14th March 1938		
10. Scheme for Poultry for table purposes.	Agricultural Assistant, A. Class.	L. Hari Krishan, B.Sc. (Agri.)	21st November 1937.		
11. Appointment of a Veterinary Investigation Officer in the Punjab.	Veterinary Investigation Officer.	Mr. Wali Mohd. Khan, B.Sc., M.R.C.V.S.	16th September 1937.	Appointed by the Imperial Council of Agricultural Research on the recommendations of the Punjab Government.	
12. Investigation of indigenous sheep breeding at the Government Cattle Farm, Hissar.	Veterinary Assistant Surgeon.	Bh. Gurbaksh Singh, L.V.P.	15th August 1936	Promoted from the Department.	
13. Scheme for determining the feeding value of certain food grains, etc.	Agricultural Assistant, A. Class.	(1) M. Mohammad Anwar Bhatty, M.Sc. (2) M. F. R. Mahmood Ali, M.Sc. (3) L. Yahspal Neb, B.Sc. (Agri.).	1st April 1939 .	Appointed by the Director of Agriculture, Punjab, who is competent to make the appointment.	

BIHAR.					
1. Rice Research Scheme* (extension sanctioned for three years from 20th January 1937).	Rice Specialist . .	Mr. M. Mahbub Alam, M.Sc. (Lucknow).	20th January 1932	Deputed from the Bihar Agricultural Department.	Economic Botanist deputed to work as Rice Specialist from the 20th January 1932.
	Assistant Botanist . .	Mr. Awadh Behari Saran, M.Sc.	24th April 1939 .	Appointed by Local Government.	*The scheme was first sanctioned for five years from 20th January 1932.
	Senior Research Assistants	Mr. M. Anwarul Aziz Khan, B.Sc. (Agra).	24th April 1939 .	Appointed by the D. A. Bihar .	
		Maulavi R. H. Naqui, B.Sc. (Agri.).	24th April 1939 .	Appointed by the D. A. Bihar.	
	Junior Research Assistants	Babu Sachindra Kumar Ray, B.Ag. (Cawnpore).	24th April 1939 .	Appointed by the D. A. Bihar.	
		Vacant.			
	Fieldmen . . .	Mr. H. C. Varma . .	16th July 1933 .	A ppointed by the D. A. Bihar.	
		Mr. L. P. Sinha . . .	1st June 1932 .	Appointed by the D. A. Bihar.	
		Mr. Leslie Jones, B.Sc. .	31st January 1938	Appointed by the D. A. Bihar.	
	Senior Plant Collectors .	Mr. M. Mohsin Akhtar .	1st March 1932 .	Appointed by the D. A. Bihar.	
		Babu Kapildeo Prasad Sinha, I.Sc. (Pat.).	7th February 1938	Appointed by the D. A. Bihar.	
	Junior Plant Collectors .	M. Shamsuddin . . .	1st June 1932 .	Appointed by the D. A. Bihar.	
		Babu Brijnandan Prasad .	21st March 1936 .	Appointed by the D. A. Bihar.	
2. Sugarcane Research Scheme.* (Extension sanctioned for 3 years from 18th March 1937.)	Sugarcane-Specialist .	Mr. K. L. Khanna, B.Sc. (Agri.) (Punjab).	18th March 1932	Recruited through the P. S. Commission (India).	*The scheme was first sanctioned for five years from 18th March 1932.
	Physiological Assistant .	Mr. P. C. Raheja, M.Sc. (Agri.) (Punjab).	17th December 1933.	Recruited through the P. S. Commission (India).	
	Chemical Assistant . .	Mr. Sailesh Chandra Sen, M.Sc.	23rd December 1933.	Recruited through the P. S. Commission (India).	
	Botanical Assistant . .	Mr. Rama Rao Panje, M.A., M.Sc., (Madras).	2nd January 1934	Recruited through the P. S. Commission (India).	
	Botanical Assistant . .	Mr. S. L. Sharma, M.Sc. .	6th November 1937.	Recruited through the P. S. Commission (India).	
	Field Assistant . .	Mr. Prabhat Kumar Rou, M.Sc.	17th December 1935.	Appointed by the D. A. Bihar.	
	Overseer . . .	Babu Shamser Chandra Ghosh	17th April 1934	Appointed by the D. A. Bihar.	
	Fieldman . . .	Babu Jauna Prasad Choudhary	1st July 1937	Appointed by the D. A. Bihar.	
	Artist . . .	Maulvi Saiyed Akhtar Hossain	1st July 1937 .	Appointed by the D. A. Bihar.	

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
BIHAR—*contd.*					
3. Ratooning scheme (sanctioned for 5 years from 19th March 1939).	Agricultural Assistant .	M. Nurul Huda Passed (certificate course, Sabour).	19th March 1939	Promoted from the Department	
	Entomological Assistant .	Babu Tirtha Prasad Sinha Choudhury, B.Ag.	25th March 1939	Promoted from the Department.	
	Laboratory Attender .	Babu Ramuchit Sharma .	24th March 1939	Appointed by the D. A. Bihar.	
	Counter	Babu Jagarnath Prasad .	15th April 1939 .	Appointed by the D. A. Bihar.	
	Counter	Babu Rajdeo Prasad . .	25th March 1939	Appointed by the D. A. Bihar.	
4. Scheme for the extension of work on Insect pest in Bihar (sanctioned for 2½ years from 9th April 1939).	Fieldmen . . .	Babu Kedarnath (B.Sc.) .	9th April 1939 .	Appointed by the D. A. Bihar.	
		Babu Akhileswari Prasad Sinha (I.Sc.).	18th April 1939 .	Appointed by the D. A. Bihar.	
		Babu Ganesh Prasad (I.Sc.) (B.A.).	18th April 1939 .	Appointed by the D. A. Bihar.	
		M. Mohammad Abrar (B.Sc. with Zoology).	18th April 1939 .	Appointed by the D. A. Bihar.	
		Babu Bhupendranath Trivedi (B.Sc. with Zoology).	20th April 1939 .	Appointed by the D. A. Bihar.	
		Babu Surendra Sharma (B. Sc. with Zoology).	28th April 1939 .	Appointed by the D. A. Bihar.	
5. Fruit Research Scheme (sanctioned for 5 years from 3rd April 1934). (Extension sanctioned for one year from 3rd April 1939).	Physiological Botanist in-charge of the scheme.	Dr. Pabitra K. Sen, Ph.D. (London) M.Sc. (Cal.), D. I. C.	2nd September 1937.	Through the P. S. Commission, India.	
	Botanical Assistant . .	Mr. Provas Chandra Malik, M.Sc.	24th May 1937 .	Appointed by the D. A. Bihar.	
	Biochemical Assistant .	Mr. Sheonath Prasad M.Sc.	13th March 1935	Appointed by the D. A. with the consultation of the Provincial Selection Board.	

	Research Assistant . .	Babu B. D. Ganguly (B. Ag. Cawnpore).	7th February 1939	Promoted from the Department	
6. Marketing Scheme, Bihar (sanctioned for 5 years from 13th March 1935).	Senior Marketing Officer .	(*a*) Mr. B. N. Sarkar, L.Ag. (Sabour).	13th March 1935	Appointed by the Local Government.	(*a*) Paid by the Government of Bihar and Orissa.
	Junior Marketing Officers .	Mr. Promod Ranjan Hansdah Acharjee, M.A., B.Sc. (Michigan).	1st June 1935 .	Through the Public Service Commission (India).	
		Mr. Manilal Harinarayan Jani, B.Sc. (Edin.) N. D. D.	28th May 1935 .	Through the Public Service Commission (India).	
		Mr. Premchandra Verma, B. Sc., Ag.	24th May 1935 .	Through the Public Service Commission (India).	
7. Scheme for the analysis of Indigenous fodders in Bihar (sanctioned for 5 years from 1st October 1936).	Chemical Assistants . .	Babu Shiva Kumar Narayan, M.Sc. (Lucknow).	1st October 1936	Appointed by the Director of Agriculture.	
		*Maulavi Zafar Ahmad, M.Sc. (Pat.) A. H. B. T. I. (Cawnpur).	1st October 1936	Appointed by the Director of Agriculture.	* Appointed to act as Senior Scientific Assistant, Chemical Section from 1st April 1938.
		Babu Thakur Prasad, M.Sc. (offg.).	1st April 1938 .	Appointed by the Director of Agriculture.	
	Laboratory Assistant .	Babu Bishombhar Jha, I.Sc. (Pat.).	3rd September 1938.	Appointed by the Director of Agriculture.	
8. Sunn-hemp scheme (sanctioned for 3 years from 4th January 1938).	Assistant . . .	M. Mohammad Fashiuddin, I.Sc.	4th January 1938	Appointed by the Director of Agriculture.	
CENTRAL PROVINCES AND BERAR.					
1. Investigation of animal diseases in the Province.	Veterinary Investigation Officer.	Mr. Bachan Singh, M.R.C.V.S.	20th June 1932 .	Recruited through the Public Service Commission.	

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
CENTRAL PROVINCES AND BERAR—*contd.*					
2. Scheme for the improvement of rice cultivation in the Central Provinces.	Botanist	Mr. B. B. Dave, L.Ag. .	1st September 1932.	Selected from the Department by the Public Service Commission.	Holds charge of the scheme.
	Assistants . . .	Mr. R. G. Joglekar, B.Ag. Post Graduate, Pusa.	18th November 1932.	Recruited locally.	
		S. L. Vishnoi, B.Ag. . .	23rd June 1933.		
		Mr. H. P. Misra, B.Ag. .	18th November 1934.		
		Mr. S. N. Walkade, B.Ag. .	29th July 1935		
3. Scheme for the improvement of Marketing in India.	Assistant Marketing Officers	Mr. A. X. Rebello, B.Ag. .	5th February 1935.	Seconded from the Department of Agriculture, Central Provinces.	
		Mr. R. N. Gadre, L.Ag. .	1st December 1937.		
		Mr. K. R. Dubey, B.Ag. .	8th November 1937.		
		Mr. R. P. Misra, G.B.V.C. .	15th February 1938.	Seconded from the Veterinary Department, Central Provinces.	
4. Sann-hemp Research Scheme	Research Assistant . .	Mr. R. D. Mukerji, B.Ag. .	11th January 1937.	Recruited locally . . .	Termination on 20th July 1938.
5. Oil seed Research Scheme .	Oil seed Specialist . .	Dr. R. H. Richharia, M.Sc., Ph.D. (Cantab.).	10th February 1937.	Recruited through the Public Service Commission.	
	Assistants . . .	Mr. D. P. Persai, B.Ag. .	5th July 1937 .	Recruited locally.	
		Mr. D. R. Dhodapkar, B.Ag.	7th July 1937 .		
6. Central Provinces Citrus Fruit Research Scheme.	Horticulturist . . .	Miss Rajul Baoji Bhai Shah, B.Ag., M.Sc. (Mich).	30th April 1937 .	Recruited through Public Service Commission.	
	Entomological Assistant .	Mr. S. A. Raja Rao, M.Sc. .	3rd August 1937	Recruited locally.	
	Chemical Assistant . .	Mr. S. S. Kafallikar, B.Ag. .	29th July 1937		
	Mycological Assistant .	W. J. Kalamkar, M.Sc. .	9th July 1938 .	Recruited locally.	
ASSAM.					
1. Investigation of animal diseases in Assam.	Veterinary Investigation Officer, Assam.	Pandit Gajanan Pande, M.Sc., M.R.C.V.S.	16th April 1933 .	Through the Public Service Commission (India).	Up to 4th January 1939.
		Mr. Bhudhar Chandra Chatterjee, G.B.V.C.	5th January 1939	.....	

2. Sugarcane Research Scheme .	Chemical Assistant . .	Mr. Hemendra Nath Pal, M.Sc. (Chemistry).	3rd October 1933	Appointed by the Director of Agriculture.
	Assistant Manager . .	Mr. Shamsuddin Ahmed .	...	...
3. Deep Water paddy . .	Economic Botanist . .	Mr. S. Majid, B.Sc. .	...	...
Farm, Habiganj . . .	Farm Manager . .	Mr. Hiron Kumar Das, B.Ag.	...	...
	Botanical Assistant . .	Mr. Jitendra Lal San, B.Ag.	...	...
4. Citrus Fruits . . .	Horticultural Assistant .	Mr. S. C. Bhattacharya, B. Ag.	...	...
Research Station . . .	Field Assistant . .	Mr. S. Dutta . . .	...	...
5. Agricultural Marketing Survey.	Senior Marketing Officer .	Mr. L. K. Hardique, B.Sc. (Edin).	13th February 1935.	Promoted from the Department.
	Assistant Marketing Officer (Crops.).	Mr. Narmad Kumar Das, L.Ag. (Hon.).	1st March 1935 .	Promoted from the Department.
	Assistant Marketing Officer (Livestock).	Mr. M. Ali, B. Sc., N. D. D..	...	...
NORTH-WEST FRONTIER PROVINCE.				
1. Improvement of marketing in the North-West Frontier Province.	Assistant Marketing Officers	Mr. D. N. Saptra, M.A., F.R.E.S. (London.)	1st May 1935 .	Recruited by the late Director of Agriculture.
			1st May 1935 .	Direct appointment.
2. (Veterinary) Scheme for investigation of disease.	Disease Investigation Officer	Mr. S. R. Chadda, B.Sc., M.R.C.V.S.	7th July 1935 .	Direct appointment.
3. San Jose Scale Survey Scheme	Senior Entomologist .	Dr. Nazir Ahmad, M.Sc., (Zoology) D.I.C. (London.)	2nd December 1937.	Through the Federal Public Service Commission.
4. Horticultural Scheme, N. W. F. P.	Horticulturist . . .	R. Zarbakht Khan B.Sc., (Edin.)	21st October 1938.	Through the Imperial Council of Agricultural Research.
ORISSA.				
1. Rice Research scheme (sanctioned for 3 years up to 31st March 1940).	Paddy specialist . .	Mr. P. D. Dixit, M.Sc. (Lucknow).	9th January 1938	Promoted from the post of the First Research Assistant and appointed through the Public Service Commission (India).
	Physiological Assistant .	Babu Jaganath Das, M.Sc. (Calcutta).	1st July 1937 .	Appointed by the Director of Development, Orissa and approved by the Imperial Council of Agricultural Research.
	Research Assistants . .	Babu Goduri Vankata Chalum. M.Sc. (Benares Hindu University).	6th July 1937 .	
		Babu Trilokinath Shivapuri, M.Sc. (Lucknow).	31st July 1937 .	
	First Research Assistant .	.....	Vacant.	
	Fieldmen Overseer . .	Babu Dhruba Charan Mahanty.	20th January 1937	Appointed by the Director of Development, Orissa and approved by the Imperial Council of Agricultural Research.
		Babu Harihar Misra, (B.Ag.)	31st July 1937 .	
		Babu Nandagiri Venkata Rao (B.Ag.).	4th August 1937 .	
		Mr. T. J. John, (B. Ag.) .	14th August 1937	
		Babu Prabhat Kumar Mukherji.	21st July 1937 .	
		Babu Artatrana Basuk .	27th June 1937	

Name of S cheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
ORISSA—*contd.*					
2. Bihar and Orissa Joint Marketing Scheme (sanctioned up to 31st March 1940).	Junior Marketing Officer for Orissa.	Babu Madan Mohan Pradhan	16th September 1937.	Appointed by the Provincial Government.	
SIND.					
Scheme for Improvement of Marketing, Sind.	Marketing Officer, Cereal Crops Group.	Mr. K. H. Advani, M.Sc. (Tex) U.S.A.	20th May 1935	Recruited through Public Service Commission.	
	Marketing Officer, Livestock Group.	Dr. L. M. Hira, G. B. V. C. A., A. R. San, I. (London).	1st September 1935.		
	Marketing Officer, Special Crops Group.	Mr. Mahomed Bachal Memon, B.Ag. (Bombay).	11th June 1935		
HYDERABAD STATE.					
1. Dry Farming Research Scheme.	Superintendent . .	Mr. Shameem Zuhrie, B.Sc., C.D.A. (Glas.).	29th August 1936	Promoted from the Department.	
	Senior Assistant . .	Mr. P. K. Savanur, B.Ag. .	4th July 1934		
2. Castor Research Scheme .	Technical Assistant . .	Dr. L. G. Kulkarni, Ph. D. .	10th September 1935.	Fresh appointment.	
	Assistant . . .	Mr. N. G. Masur, B.Ag. .	10th October 1935	Services obtained from the Bombay Government.	
MYSORE STATE.					
1. Scheme for the improvement of the quality of Indian coffee.	Assistant Chemist . .	Mr. N. G. Chokkanna, M.Sc., Ph.D.	1st March 1939 .	Appointed by State Government.	
2. Sugarcane Research Scheme (Breeding of Thick Canes).	1. Senior Assistant Botanist	Mr. B. Venkoba Rao, B.Sc. .	14th April 1937 .	By promotion in the Department.	
	2. Junior Assistant Botanist	Mr. M. L. Subbanna, B.Sc. (Hons.).	1st February 1933	Appointment by State Government.	
	3. Statistician . . .	Mr. A. Anantha Padmanabha Rao, B.A., F.R. Mel. Soc.	1st February 1939	By promotion.	
	4. Assistant Chemist .	Mr. K. Lakshmi Narayana Bhatta, B.Sc.	1st February 1939	Appointed by State Government.	
Investigation of Johne's Disease Research Scheme.	Veterinary Inspector .	Mr. S. Srinivasamurthy, B.Sc., L.V.P.	21st January 1935	Fresh appointment.	

4. Fruit Research Scheme .	Manager, Fruit Research, Station.	Mr. N. S. Iyengar . .	...	.....
5. Sugarcane Borer Work . .	Assistant Entomologist .	Mr. H. A. Abdur Rub, B.Sc..	8th February 1939	By promotion.
BARODA STATE.				
Investigation of suitable types of canes in Gujarat.	Sugarcane Chemist . .	Mr. Kusumayudh Chunilal Desai, B.Ag.	16th November 1936.	Recruited through the State Service Committee.
TRAVANCORE.				
Scheme for the investigation of the root and leaf diseases of coconut palms.	Plant Pathologist . .	Dr. K. P. V. Menon, B.Sc., D.I.C. Ph.D. (London).	8th March 1937 .	Direct appointment.
	Assistants to the Plant Pathologist.	Mr. U. Karunakaran Nair, B.A., B.Ag.	26th March 1937	Promoted from the Department.
		Mr. K. Madhusudanan Pandalai, B.A., M.Sc., Ph.D., A.I.C.	1st September 1937.	Direct appointment.
CALCUTTA UNIVERSITY.				
1. Properties of Colloid Soil Constituents (Extended Scheme).	Soil Chemists Assistant .	Mr. R. P. Mittra, M.Sc. (Cal.)	1st November 1935.	Direct appointment.
		Mr. B. Chatterjee, M.Sc. (Cal.).	1st December 1937.	Direct appointment.
		Mr. S. K. Mukherjee, M.Sc. (Cal.).	1st November 1938.	Direct appointment.
2. Investigation of the Life-history, Bionomics and Development of Fresh Water fishes of Bengal.	Research Assistants . .	Mr. Motiranjan Das Gupta, M.Sc.	1st December 1936	
		Mr. Santosh Kumar Majumdar, M.Sc.	1st September 1937	
3. Statistical Studies and Training of Agricultural Officers in Statistics.	Teaching Assistant . .	Mr. S. N. Roy, M.Sc. . .	November 1938 .	Temporary appointment by the Syndicate of the Calcutta University.
	Research Assistants . .	Mr. R. C. Bose, M.A. . .	June 1935 . .	Appointed to the present post through the Federal Public Service Commission in June 1935.
	Computers . . .	1. Sudhir Kumar Banerjee .	July 1931 . .	Appointed by the Syndicate of the Calcutta University.
		2. Jaladhar Sarma . .	July 1931 . .	
		3. Subodh Chandra Das Gupta.	February 1935 .	
		4. Naresh Chandra Mukerjee	February 1938 .	

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
DACCA UNIVERSITY.					
1. Dacca University Scheme of research on the Lateritic soils of India and on the nutrition of the rice plant.	Senior Assistant (Biochemist).	Dr. P. K. De, M.Sc. (Dac.) A.I.I.Sc., Ph.D. (Lond.).	11th August 1930	Appointed through a Selection Board.	
	Assistant in Soil Chemistry	Mr. J. N. Chakravarty, M.Sc. (Dac.), Post-Graduate Diploma, Pusa.	11th August 1930	Appointed through a Selection Board.	
	Typist, Assistant .	Mr. Muhammad Hatem Ali, B.Sc.	11th November 1935.	Appointed through a Selection Board.	
2. Scheme for investigation on Organic—Constituents of Indian Soils.	Research Assistant .	Mr. Haridas Bhowmik, M.Sc. (Dac.).	5th January 1939	Appointed by the Executive Council, Dacca University.	
	Research Assistant . .	Mr. Jyotirindra Mohan Sen, M.Sc. (Dac.).	5th January 1939	Appointed by the Executive Council, Dacca University.	
AGRA UNIVERSITY.					
Investigation on "Cereal Rusts".	Mycologist Assistant .	Mr. Raghubir Prasad Gupta, M.Sc. (Agra). Botany with special paper on parasitic Basidiomycetes. (including rusts).	11th April 1930 .	Direct appointment.	
	Senior Research Assistant	Mr. H. L. Gulatia, B.Sc., (Punjab); M.Sc., (Hons. Sch.) (Punjab)—Botany.	1st November 1931	Direct appointment.	
	Research Assistants . .	Dr. B. M. Johri, M.Sc., (Agra); D.Sc. (Agra).	1st September 1937	Direct appointment.	
		Mr. J. L. Merh, M.Sc. (Allahabad).	10th May 1935 .	Direct appointment.	
	Junior Research Assistants	Mr. Ram Piyara Mal, B.Sc. (Ag.) (Punjab).	1st April 1933 .	Direct appointment.	
		Mr. T. B. Lal, B.Sc., (Ag.) (Allahabad) Assoc. I.A.R.I.	7th February 1938	Direct appointment.	

	Meteorological Assistant .	Mr. Gulab Chand Goyal, M.Sc. (Agra).	15th July 1935 .	Direct appointment.	
	Personal Research Assistant to Officer-in-Charge.	Mr. D. D. Gupta, B.Sc., Hons. Agric. (Wales).	16th December 1937.	Direct appointment.	
	Lecturer in Botany . .	Dr. R. P. Asthana, M.Sc. (Allahabad); Ph.D. (London); D.I.C. (London).	10th July 1936 .	Direct appointment.	
	Morphological Assistant .	Mr. H. R. Bhargava, M.Sc. (Agra)—Botany.	28th July 1937 .	Direct appointment.	
	Assistant for Survey (Punjab).	Mr. Kartar Singh Grewal, M.Sc. (Punjab).	30th January 1939	Direct appointment.	
	Assistant for Survey (Madras).	Mr. T. V. Pattabhiraman, B.Sc. (Ag.) (Madras).	10th October 1935	Direct appointment.	
UNIVERSITY OF MADRAS.					
Scheme of Research on Morphology and Anatomy of Sugarcane Sorghum Hybrids.	Assistant . . .	Mr. K. R. Ramanathan, M.Sc.	(Up to November 1938).	...	The work is carried on under the supervision and guidance of Dr. T. Ekambaram.
		Miss V. K. Kamalam, B.Sc. (Hons.).	January 1939 .	Direct appointment.	
BENARES HINDU UNIVERSITY.					
Scheme of Research on the Physiology of cane and wheat.	Physiologist incharge of the scheme.	Professor B. N. Singh, D.Sc.	...	...	Director of the Scheme.
	Assistant to relieve Professor B. N. Singh of part of his university work.	Mr. K. Kumar, M.Sc. . .	1st June 1937 .	Appointed by the Council, Benares Hindu University, *vide* resolution No. 74 (*a*), 25th July 1937.	
	Senior Research Assistant	Dr. K. N. Lal, D.Sc. . .	1st June 1937 .	Appointed by the Council Benares Hindu University, *vide* resolution No. 69 (*a*), 24th July 1937.	
	Junior Research Assistant	Mr. S. N. Singh, M.Sc. (Agric. Bot.).	1st June 1937 .	Appointed by the Council, Benares Hindu University, *vide* resolution No. 69 (*b*), 24th July 1937.	
	Laboratory Assistant .	Mr. P. V. V. Seshagiri, M.Sc. (Agric. Bot.).	1st June 1937 .	Appointed by the Council, Benares Hindu University, *vide* resolution No. 69 (*c*), 24th July 1937.	

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
LUCKNOW UNIVERSITY.					
Helminthiasis Scheme . .	Research Assistant . .	Dr. Bipin Bihari Sinha, D.Sc.	February 1937 .	Direct recruitment from the University of Lucknow.	The candidate was already at the University and was well qualified for the post.
ALLAHABAD UNIVERSITY.					
Nitrogen loss from Soils and nitrogen fixation in Soils.	(1) Chemical Assistant .	N. N. Biswas, M.Sc. . .	1st August 1936 .	Appointed by the Imperial Council of Agricultural Research on the recommendation of Professor N. R. Dhar.	
	(2) Bacteriological Assistant.	E. V. Seshacharyulu, M.Sc. .	1st August 1936 .		
INDIAN INSTITUTE OF SCIENCE, BANGALORE.					
1. Extension of work on "Quality" of Crops.	Assistant Biochemist .	Dr. A. Sreenivasan, M.A., D.Sc., D.I.C.	...		
2. Investigation for preparation of cheap synthetic manure from town refuse and waste materials.	Assistant Biochemist .	Dr. C. N. Acharya, M.Sc., Ph. D., A. I. C.	...		
ALLAHABAD AGRICULTURAL INSTITUTE.					
A Scheme for research on the composition of milk.	Assistants . . .	Ishwar Das Dharni, B.Sc. (Hons.) M.Sc.	1st July 1936 .	Transferred from position as Teacher of Chemistry at Ewing Christian College.	Reverted on 30th June 1938.
		B. F. Agarwal, B.Sc. (Agr.) .	1st July 1936 .	Appointed direct, being available as he had just completed his B.Sc. (Agr.).	
		S. R. Roy, B.Sc. (Agr.) .	1st July 1938 .	Appointed direct.	
GOKHALE INSTITUTE OF POLITICS AND ECONOMICS, POONA.					
Scheme for Research in Agricultural Economics.	Director, Gokhale Institute of Politics and Economics.	D. R. Gadgil, M.A., M.Litt. (Cantab.).	1930 . . .		
	Senior Investigator. . .	V. R. Gadgil, B.Ag. (Bom.), M.Sc. (Calif.).	1931 . ..		

APPENDIX XI.

SUGAR COMMITTEE.

(As approved by the Governing Body at their meeting held in July 1939.)

Chairman—Vice-Chairman, Imperial Council of Agricultural Research . . . 1

I. *Experts—Central and Provincial—*

(*a*) *Central Government Experts—*

(*i*) Agricultural Commissioner with the Government of India.
(*ii*) Director, Imperial Agricultural Research Institute.
(*iii*) Director, Imperial Institute of Sugar Technology.
(*iv*) Imperial Sugarcane Expert to the Government of India.
(*v*) Agricultural Marketing Adviser to the Government of India.

(*b*) *Provincial and state Government Experts—*

Representatives of the Department of Agriculture—

(*i*) Madras	1
(*ii*) Bengal	1
(*iii*) United Provinces	2
(*iv*) Punjab	1
(*v*) Bihar	2
(*vi*) Mysore	1

II. *Representatives of the Sugar Factories—*

(*i*) Representatives of the Indian Sugar Mills Association	2	To be nominated by the Association concerned.
(*ii*) Representatives of the Indian Sugar Producers' Association	2	
(*iii*) Representative of the West India Sugar Factories	1	To be nominated by the Hon'ble the Chairman, I. C. of A. R.
(*iv*) South India Sugar Factories	1	
(*v*) Bengal Sugar Factories	1	
(*vi*) Others	1	
(*vii*) Representative of the Khandsari Industry	1	

III. *Representatives of the Sugarcane Growers—* 8

(*i*) United Provinces—	3	To be nominated by the Provincial Governments.
(Cane Commissioner	1	
Non-officials	2)	
(*ii*) Bihar—	2	
(Cane Commissioner	1	
Non-official	1)	
(*iii*) Punjab	1	
(Non-official	1)	
(*iv*) Bengal	1	
(Non-official	1)	
(*v*) Madras—	1	
(Non-official	1)	

IV. *Representatives of the Sugar Trade—* 2

(*i*) To be nominated by the Bombay Sugar Merchants' Association	1
(*ii*) To be nominated by the Cawnpore Sugar Merchants' Association	1

V. *Nominations by the Hon'ble the Chairman to represent the consumers* . . . 3

Secretary, 36

Imperial Council of Agricultural Research—Secretary, *Ex-Officio.*

GLOSSARY.

Aman paddy	Winter rice sown at the end of rains and harvested in November.
Aus paddy	Early rice (sown with early rains and harvested in August).
Bajra	Pearl millet. *Pennietum Typhoideum.*
Boro	Summer Rice (Bengal).
Chilgoza	*Pinus Gerardiana.*
Cholam	Sorghum.
Dorsa Soil	A name for medium type of soil in the Central Provinces.
Gajanimma	Tamil word for sweet lime.
Guara	*Cyamopsis psoralioides.* A Kharif Leguminous crop.
Gur	Unrefined Indian sugar, Jaggery.
Jamberi, Jambri, Jhatti Khatta	Type of sour lime. *Citrus medica var acida.*
Jowar	Sorghum. *Andropogon Sorghum.*
Kanhar Soils	A name for heavy soils in the Central Provinces.
Kharna Khatta	*Citrus limonum.*
Kharif	Crops sown at the beginning of the rains and reaped from October to December; also applied to the season.
Khesari	Latyrus Sativa.
Matasi soils	Light sandy loam type of soil in the Central Provinces.
Nigar	A practice of draining the land in paddy cultivation in Bihar.
Parwaria	Name for late varieties of sunn in Bihar.
Rabi	Crops sown in the autumn and reaped at the end of the cold weather; applied to the season.
Raya	*Brassica Juncea.*
Ragi	*Eleusine Coracona.*
Sarson	*Brassica compestis var Sarson.*
Santra (Sangtra)	Orange.
Taramira	*Brassica Nigra.*
Toria	*Brassica Napus var dichoroma.*

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